EXPERIMENT STATION RECORD.

Editor: E. W. ALLEN, Ph. D., *Chief, Office of Experiment Stations.*
Assistant Editor: H. L. KNIGHT.

CONTENTS OF VOL. 37, NO. 8.

SUBJECT LIST OF ABSTRACTS.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

METEOROLOGY.

SOILS: FERTILIZERS.

AGRICULTURAL BOTANY.

FIELD CROPS.

HORTICULTURE.

FORESTRY.

DISEASES OF PLANTS.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING.

VETERINARY MEDICINE.

RURAL ENGINEERING.

RURAL ECONOMICS.

AGRICULTURAL EDUCATION.

MISCELLANEOUS.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

[1] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

VOL. 37. DECEMBER, 1917. No. 8.

The beginning of the new academic year this fall was awaited by most institutions devoted to higher education with unusual uncertainty and apprehension. The declaration of a state of war in April had profoundly affected these institutions almost immediately. Attendance, which in most colleges and universities had been steadily rising from year to year, was suddenly depleted as the call came for one form or another of National service, in some places the campus emptying almost over night. Some institutions closed their doors early in May, and in others work went on under greatly altered conditions. Commencements were quite generally omitted or curtailed, and July 1 found the undergraduates nearly as widely scattered as the alumni, with every indication that a considerable percentage would never return and that entering classes might also be much smaller than for many years.

The seriousness of such an outcome, not merely to the institutions but to the ultimate welfare of the Nation, was quite generally foreseen, but there was also more or less uncertainty as to the duty of the institutions and the individual students under the emergency conditions. It was apparent that the Nation had immediate need of thousands of its young men, many for military service and many along other lines; that the shortage of labor on the farms, in the factories, and elsewhere was enormous; and it was inevitable that such factors would influence many a boy against beginning or continuing a college course which would even temporarily keep him from active participation in the strenuous work of the conflict itself. On the other hand it was also seen that the war had vastly increased the need for trained men and that the supply of these men could not safely be allowed to fail.

In response to an inquiry from the Secretary of the Interior as to the duty of the colleges and technical schools during the war, the situation was admirably stated by President Wilson in a letter of July 20, 1917, as follows: "The question which you have brought to my attention is of the very greatest moment. It would, as you suggest, seriously impair America's prospects of success in this war if the supply of highly trained men were unnecessarily diminished.

There will be need for a larger number of persons expert in the various fields of applied science than ever before. Such persons will be needed both during the war and after its close. I therefore have no hesitation in urging colleges and technical schools to endeavor to maintain their courses as far as possible on the usual basis. There will be many young men from these institutions who will serve in the armed forces of the country. Those who fall below the age of selective conscription and who do not enlist may feel that by pursuing their courses with earnestness and diligence they also are preparing themselves for valuable service to the Nation. I would particularly urge upon the young people who are leaving our high schools that as many of them as can do so avail themselves this year of the opportunities offered by the colleges and technical schools, to the end that the country may not lack an adequate supply of trained men and women."

Subsequently, under date of November 23, 1917, a letter of much the same tenor from the Secretary of War to the chairman of the special committee on universities and colleges of the Council of National Defense was made public, which reads as follows: "The successful outcome of the war is so dependent upon the applications of science that the United States can ill afford at this time to risk any diminution of this supply of technically trained men. Such diminution we must in part suffer by reason of the fact that class exemptions in the execution of the selective service law are prejudicial to its general success, but I have constantly in mind the fact that the Government service will demand more and more scientifically trained men, and so I hope those who are in charge of scientific institutions will impress upon the young men the importance and desirability of their continuing their studies except to the extent that they are necessarily interrupted by a mandatory call under the provisions of the selective conscription law."

It will be noted that in both these statements particular stress is laid upon the need for men trained in applied science. In this group would be included, of course, the graduates of the agricultural colleges. In view of the important and unique functions which these institutions have to fulfill, and the realization that in some ways the conditions regarding their prospective attendance differed from those in other institutions, it was deemed of general interest to attempt to ascertain, after their reopening, how they had fared as regards enrollment. Information was, therefore, sought by the States Relations Service as to the initial registration of college students in agriculture this fall as compared with the previous year, and also as to how any changes in the enrollment in agriculture compared with other kinds of education. A general survey of the existing situation, rather than a collection of statistical data, was

needed, although numerical data were gathered so far as readily available. Opinions were also sought as to any obvious changes in the character of the enrollment, as in age of students, relative proportion from farms and cities, proportion of men and women, purpose in coming to college, selection of courses of study, and similar matters, and especially as to the apparent underlying causes for such changes as were noted.

Information was supplied on some of these points by 48 institutions, located in 42 States and Hawaii. The reports covered nearly all sections of the country, and it is believed are representative of the situation as a whole. Although the inquiry necessarily reached the presidents, deans, and registrars at an exceptionally busy period, in most cases very complete data were furnished by these officials, through whose courteous response the preparation of this summary is made possible.

The data available indicate very clearly that a considerable shrinkage in total student enrollment in higher education occurred quite generally throughout the country. For the land-grant institutions this apparently averaged slightly over 20 per cent. In no institution reporting was there any considerable gain, although in such widely separated States as North Dakota, Oregon, South Carolina, Texas, and Virginia, substantially the registration of the previous year was maintained. On the other hand, decreases of nearly 50 per cent were encountered in a large university of the Middle West and a small southwestern college. The average percentage of falling off for the group, however, was probably less than for many of the oldest and best known universities of the country, press reports announcing, for instance, decreases of about 40 per cent for Harvard, Yale, and Princeton.

As regards students in agriculture, the showing is considerably less favorable than for total enrollment. The average decrease for the institutions reporting was slightly over 30 per cent and in numerous cases exceeded 50 per cent. Some sectional variation was noticeable, several southeastern colleges maintaining their previous registration and others falling only slightly below it, while losses were exceptionally heavy in the Southwest and in the Middle West.

On the other hand, the average decrease in the mechanic arts was approximately only 15 per cent and did not exceed 36 per cent for any institution. Four colleges reported gains of from 11 to 14 per cent, and in eight others the loss was under 10 per cent. These comparatively small losses were apparently typical of the technical schools in general, the Massachusetts Institute of Technology, for instance, reporting a loss of 18 per cent and the Carnegie Institute of Technology one of 16 per cent.

It seems probable that the explanation for the great difference noted between agriculture and the mechanic arts needs be sought in several directions. The unprecedented shortage of farm labor and the emphasis placed on an adequate food supply as a war measure doubtless kept many a boy on the farm, where his services could ill be spared, and the fact that his college training was unfinished, or even not begun, seemed much less important than his immediate availability as a dependable labor unit. More of the mechanic arts students, however, are recruited from the towns and cities, and while the labor shortage afforded them unusual opportunities for lucrative employment along industrial lines, they were often freer to follow their inclinations and the temptation to drop out of college was less keen because the opportunities were less closely associated with their chosen professional work. The enormous demand for trained engineers, chemists, and similar technically educated men was a strong inducement to boys graduating from high school to go to college and prepare themselves along these lines, while the limited field for half-trained workers discouraged the abandonment of the courses already begun. In short the feeling, formerly well-nigh universal and never entirely overcome, that thorough training is a necessity in the mechanic arts but less essential in agriculture, very likely explains some of the differences in relative enrollment.

In general the remaining courses offered by the land-grant institutions showed losses greater than for the mechanic arts and smaller than for agriculture, but there were many local variations. Even the enrollment of women, whether in home economics courses or in colleges of liberal arts, showed a considerable decrease in many cases, though this as a rule was less than the diminution of men and in some cases there were slight gains. The number of women students in agriculture continued to be too small for safe generalizations, but gives little indication of any increasing trend in this direction.

Analysis of the registration by classes revealed heavy losses at every stage. As would be expected, the senior class was largely effected, decreases of from 40 to 60 per cent being not uncommon. Obviously this class contains more men of draft age than those below it, and in many institutions men with longer military training, hence the call to the colors has been specially strong. Senior students also possess the maximum of specialized agricultural training and their services are in great demand along these lines. While it is desirable that the seniors should return and complete their work, particularly since these students include some of the most mature and otherwise promising material for development as teachers, investigators, and extension workers, withdrawals seem in many instances inevitable under the existing conditions.

The depletion of the junior and sophomore ranks was found to be somewhat smaller in most institutions. The reasons actuating withdrawals were substantially the same as with seniors, but applied with decreasing force, so that it seems probable that losses will be relatively somewhat less numerous and less detrimental.

The entering classes, however, present a special problem for consideration. Before the war steadily increasing numbers of freshmen, in many cases taxing the capacity of the college, had been the rule, but this fall thirty-six institutions reported losses ranging from 8 to 60 per cent. The Texas College, to be sure, reported an increase of over 12 per cent, resulting in the largest class in its history, and four others showed smaller gains, but the average for the entire group is a loss of about 25 per cent.

This percentage is, of course, smaller than for the entire enrollment in the colleges of agriculture, but it is none the less disquieting. In eighteen institutions it ranged from 30 to 40 per cent, whereas in mechanic arts courses only one institution showed an entering class more than 25 per cent below that for the previous year, while in fourteen others the losses were under 10 per cent and six showed gains of from 78 to 165 per cent. The percentage loss in freshman agricultural students was also considerably greater in the majority of institutions than for most other courses, although in some cases the falling off among male students in liberal arts was also large.

Expressed not in percentages, but in actual numbers, the data are even more striking. For the institutions available the freshmen aggregated in 1916, 4,630, and in 1917, only 3,463. This means a decrease of 1,167 freshmen students in agriculture in the 41 States reporting this item.

So heavy a decrease in this group, especially if it portends similar small entering classes for several years to come, must be regarded as unfortunate. It is unlikely that many of the boys who are thus foregoing a college course are of draft age or that any considerable proportion is engaged in military service. It seems probable that most of them have stayed on the farm, where they have indeed rendered sorely needed assistance, but it may be at a cost of an ultimate serious loss of hundreds of trained men to the Nation. The fact that the full extent of this loss will not be evident for several years only emphasizes how difficult it will be to remedy it when it becomes apparent. It would seem that special efforts should be made by the colleges to enlighten prospective students as to the unusual opportunities for trained agricultural workers within the next few years. Some institutions have already begun work along this line.

The group of students most seriously affected of all is, as would be expected, that of graduate students. The data reported as to these students are somewhat less complete than for undergraduates,

since in the larger universities they are quite often enrolled in general graduate schools instead of in the colleges of agriculture. For eighteen institutions reporting graduate students in agriculture in 1916, the aggregate enrollment has dropped from 410 to 202, or over 50 per cent. This condition will doubtless continue or perhaps be aggravated, since most of these students are of draft age and openings for active employment were never more numerous.

Another phase of the matter which needs consideration is the subsequent dropping out of the students who have returned to college. Hardly an issue of a college paper has appeared this fall without items announcing such withdrawals. Many of these are for military service, but others are often for less vital reasons and should be kept at a minimum. As the committee on instruction in agriculture pointed out in its recent report to the Association of American Agricultural Colleges and Experiment Stations, "in this country and abroad, agriculture is now recognized to be of importance second only to the military service, even under war conditions. On this account there is a heavier burden of responsibility upon the young men of our agricultural colleges—students and graduates alike—who have not been called to military service. The burden is greater not only because of the demand for greater production, but also because of the smaller number of young men available for positions as teachers, as specialists, and as organizers in field demonstration work. It is, therefore, highly important that the agricultural college students who are not yet subject to the draft, as well as those who have been excused from military service, remain in college and make the best of every opportunity to prepare themselves for these heavier burdens, and it is incumbent upon the colleges of agriculture not only to urge this point of view, but to provide for these young men the best teaching and the most thorough training to be had."

Something can doubtless be done in many colleges to provide special courses to meet the emergency needs. Thus, as regards the training of teachers, the same committee states that whereas at the outbreak of the war there were upwards of a thousand college-trained young men teaching agriculture in schools below college grade, the number has now been seriously depleted, while the development of work under the Federal Vocational Education Act alone will create a demand for several hundred additional instructors with such training. It is suggested that the colleges can do much to "prevent the serious lowering of standards by increasing their facilities for training undergraduates for the teaching profession, by conducting emergency courses for teachers now in service, and by the intensive training along agricultural lines of college graduates in arts and science courses."

In some States the pressure upon students to return to the farms has been lessened and considerable assistance rendered in alleviating the labor problem by shortening the college year and providing a more intensive training. Many institutions deferred the opening of their doors until October, and others made special provisions for students whose return was retarded because of farm needs. The University of Nebraska has already announced its intention of closing its school of agriculture early in March next year and the college of agriculture early in April.

Recognition of the work of students leaving before graduation to engage in war service by some form of war certificate has been suggested by the executive committee of the Association of American Agricultural Colleges and Experiment Stations. It was pointed out that such a certificate would not only be much appreciated by many former students and their relatives, but would also serve to strengthen the bond between the student and the institution, and perhaps facilitate and render more probable his eventual return for the completion of his work.

Emergency short courses in agriculture have already been offered by a number of institutions and their further development seems logical. One interesting innovation along this line is being undertaken at the University of California, which is offering to a limited number of inexperienced men practical training as milkers, teamsters, and other branches of farm labor. Such courses, if successful, would help relieve the dearth of labor and it is possible that modifications of the idea might be worked out to attract greater numbers of town and city-bred boys to regular college work. One large college of agriculture in the Middle West reported that an increasing realization of the need for practical farm experience had in a measure decreased the registration from the cities in recent years, and the present inquiry indicated that the war had thus far not materially affected the proportion of country and city-bred students. It is well understood that the city-bred boy in the agricultural college has in the past been more or less of a problem, but his presence there in increasing numbers would at least possess the advantage of not diminishing appreciably the supply of available farm labor, while under the present conditions provision for the necessary farm experience before graduation would probably be found somewhat less difficult than formerly.

Serious as the shrinkage of students appears, it need not prove an absolute calamity. The efficiency of educational institutions is not measured by the enrollment, and this is specially true of the agricultural colleges, the tuition fees in which constitute under normal conditions little over 10 per cent of their income. To quote

again from the committee on instruction in agriculture, during the past fifteen or twenty years nearly every agricultural college in the country has been working at high pressure. Nearly all of them have been growing more rapidly in enrollment than in teaching staff and equipment. The result has been crowded class rooms, large laboratory sections, many hours in class and laboratory for teachers with correspondingly few hours for preparation, and too much of a tendency to get things done somehow, whether well done or not.

"Just now there seems to be a breathing spell so far as the resident teaching work is concerned. There are fewer students, probably 20 per cent less. The class rooms are less crowded. The sections are smaller, and the number of students each instructor is required to teach has in many cases decreased. The present time seems, therefore, to be opportune to consider how we have been doing things and how we may do better."

The committee was of the opinion that for these reasons not within a decade "has there been a time so favorable for giving serious attention to measures for improving the quality of teaching in the colleges themselves as the present war emergency affords." It is to be hoped that this optimistic view will prove justified, though there should not be overlooked the serious depletion of faculties or the possibility that in some States the reduction in enrollment may afford a pretext for a curtailment of financial support.

The decreased burden of teaching may also open up opportunities in many cases for greater attention to research and extension work. It may thus permit, for example, considerable additional investigation and experimentation which has a definite and direct bearing on present agricultural problems and so render a most timely and valuable service.

If the reduction in enrollment of agricultural students by nearly one-third seems discouraging, it is well to reflect that in England wholesale losses of faculties and students have occurred, that several institutions have closed their doors, and that others have been very seriously restricted in their operations. Likewise the Ontario Agricultural College reports a smaller registration in the entire institution than in its freshman class prior to the war. In our own country no such developments are expected and often the enrollment is far in excess of that of a few years ago. Some of this difference is probably due to the fact that in this country the principle of selective service was adopted as the basis of raising the National Army. When the importance of trained agricultural leadership becomes thoroughly realized, particularly in its relations to the existing emergency, there need be little doubt that the agricultural colleges, as the training ground for such leadership, will receive and retain the full support in every direction which they will need for this vital service.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Chemical studies in making alfalfa silage, C. O. SWANSON and E. L. TAGUE (U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 6, pp. 277–292). This is a preliminary report of two series of experiments on chemical studies in the making of alfalfa silage, carried out at the Kansas Experiment Station. The first series of experiments, started in 1912 and continued for four years, was conducted in quart milk bottles; the second series, started in 1914 and continued in 1915, in 10-ton experimental silos. A portion of the work has been reported (E. S. R., 37, p. 671), and a complete report will be published later. The conclusions drawn by the authors are based on the results obtained from both series of experiments.

It was found that silage could be made from alfalfa alone if absolute exclusion of air and retention of carbon dioxid could be secured. These conditions, however, indicated as not practical of realization. The addition of sugar to the silage was found to insure a more rapid and plentiful production of acids, which makes conditions for putrefactive organisms unfavorable. Wilted alfalfa was more suitable for silage than unwilted. The addition of water to the wilted alfalfa was harmful, while no decisive results were obtained by the addition of water to wilted alfalfa.

Molasses was found to be the most effective supplement tried. Germinated corn was more effective as a supplement to alfalfa than sound corn, the results obtained being similar to those produced by molasses. It is indicated that rye might be a suitable supplement but for the strong odor which it imparts to the silage.

The value of tightness of packing lies only in the fact that it makes the exclusion of air more certain.

In good alfalfa silage about one-third of the nitrogen was found to be in the amino form, while in bad silage the amount was sometimes one-half that of the total nitrogen.

Most of the acids present in alfalfa silage are produced in the first two days. The percentage of acidity may increase after that, but the increase is relatively slight. The alfalfa, as it is put into the silo, contains only a small amount of nitrogen in amino form. Most of the change of nitrogen into this form takes place in the first 10 days. Silage from wilted alfalfa contains more nitrogen in this form than that made from fresh alfalfa. Sugar added to the materials used in making silage disappears very rapidly. Commercially matured silage contains no sugar."

The isolation of parahydroxybenzoic acid from soil, E. H. WALTERS (Jour. Amer. Chem. Soc., 39 (1917), No. 8, pp. 1778–1784).—An aromatic acid whose identity with parahydroxybenzoic acid was established was isolated from a

sandy soil from Florida. Benzoic acid was also isolated from this soil, but in a much smaller quantity.

Parahydroxybenzoic acid was isolated by the extraction of 23 kg. of soil with about 75 liters of an aqueous 2 per cent solution of sodium hydroxid at room temperature for 24 hours. The extract was acidified slightly with sulphuric acid and filtered. The acid filtrate was extracted with ether, the ether extract concentrated to a volume of about 200 cc., and then treated with a concentrated solution of sodium bisulphite to remove aldehydes, etc. The bisulphite solution was drawn off and extracted several times with fresh ether, and the ether extracts combined and slowly evaporated on the surface of a small volume of warm water. The water solution was heated to boiling and filtered while hot to remove any insoluble oily residue. A crystalline compound separated from the cold concentrated aqueous solution. This was purified by repeated crystallizations from water, but the product thus obtained persistently retained a slight tinge of color which was removed only after many crystallizations and boiling with a small quantity of purified bone black. Much of the material was lost in this procedure. The aqueous solution was finally subjected to steam distillation to remove benzoic acid and other volatile substances which might be present. The solution in the distilling flask was evaporated to dryness and the residue extracted with chloroform to remove final traces of benzoic acid. The substance was finally recrystallized from water.

The confirmatory tests of the acids are described and the significance of their presence in the soil discussed.

Studies on the seed of Spartium junceum, M. RAFFO (*Ann. Chim. Appl. [Rome]*, 7 (*1917*), *No. 5-8, pp. 157-164*).—The seed examined was found to contain a lipolytic enzym having but slight action in an acid medium, but marked action in the presence of sodium carbonate.

A yield of about 10 per cent of a green colored oil with an aromatic odor was obtained from the seeds. The following constants were determined for the oil: Specific gravity at 15° C., 0.9403; refractive index at 25°, 73.5; acid value, 2.9; saponification value, 188.6; iodin value, 134; Hehner value, 89.85; and Reichert-Meissl value, 0.44. The fatty acids obtained from the oil yielded the following constants: Specific gravity at 17°, 0.9208; melting point, 26.6–27°; solidifying point, 21.3°. The oil is classed with the group of semidrying oils.

Occurrence of raffinose in the seed of the jute plant (Corchorus capsularis), H. E. ANNETT (*Biochem. Jour., 11 (1917), No. 1, pp. 1-6*).—The author reports the isolation of raffinose from the seed of the jute plant. The seed examined contained about 2.25 per cent of the sugar. The crude raffinose was obtained by precipitating an alcoholic extract of the seed (after previous extraction with ether and petrol) with ether. The impure material so obtained was recrystallized from 80 per cent alcohol, rosettes of white needles depositing in several days.

The confirmation tests are described in detail.

The chemistry of wood.—III. Mannan content of the gymnosperms, A. V. SCHORGER (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 748–750, fig. 1; Jour. Forestry, 15 (1917), No. 2, pp. 197–202, fig. 1*).—Continuing the study previously noted (E. S. R., 37, p. 502), the author examined 22 different species of gymnosperms and 6 of angiosperms for mannan and found it present in appreciable quantities in all of the conifers, but absent in the hardwoods. The sapwood was generally found to contain larger amounts of mannan than the heartwood. The content was found to decrease from the base upward, but was uniform throughout the heartwood in a radial direction.

the industrial importance of mannan in the production of ethyl alcohol from sulphite liquor and by the hydrolysis of sawdust with catalyzers is pointed out.

The mannan was determined by precipitation of the mannose formed on hydrolysis as mannose hydrazone.

The effects of exposure on some fluid bitumens. C. S. REEVE and R. H. [illegible] (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 743-746, fig. 1*).

The importance of uniform culture media in the bacteriological examination of disinfectants, J. H. WRIGHT (*Jour. Bact., 2 (1917), No. 4, pp. 315-346, fig. 1*).—The results of the study reported show that variations in culture media are the cause of the majority of the discrepancies obtained in the bacteriological examination of disinfectants. The hydrogen ion concentration of the culture medium was found to exert important influences on its composition and on its suitability for the growth of the typhoid organism. A marked relationship between the hydrogen ion concentration of the culture medium and the resistance of the test organism to the action of disinfectants was observed.

"The most satisfactory and uniform results have been obtained with a culture medium in which the P_H value falls between 6 and 7. This condition is readily obtained with a medium containing 10 gm. of Witte's peptone, 3 gm. Liebig's meat extract, and 5 gm. of salt, boiled 15 minutes, filtered, tubed, and sterilized, with no attempt to adjust the acidity."

The experimental data are submitted in tabular and graphical form.

A simple ultramicroscope, C. C. KIPLINGER (*Jour. Amer. Chem. Soc., 39 (1917), No. 8, p. 1616, figs. 2*).—A simple apparatus, which has yielded good results in practice, and its manipulation are described.

Sampling tubes for manure, alfalfa, or other organic materials, A. D. [illegible] (*Mo. Bul. Com. Hort. Cal., 6 (1917), No. 7, pp. 225-228, figs. 4*).—A device for sampling organic materials is described and illustrated.

"The apparatus . . . consists of a tube somewhat similar in arrangement and appearance to the King soil tube. Two different sizes of sampling tubes have been made, one for use in sampling car load or other large lots of manure, and the other for sampling bales of alfalfa, bean straw, cornstalks, or other similar materials. The manure sampling tube is about 6 ft. in length and about 2 in. in diameter. One end is made with a sharp sawtooth-like cutting edge so arranged as to cut down through the manure somewhat on the principle of the knives commonly used for cutting hay in the stack. At the other end of the tube an extra ring of metal is welded onto the tube in order to give it additional support. A hole is cut through this ring and the tube so that a handle may be pushed through it for use in twisting the tube when the sample is being taken."

A sampling press, W. B. CLARK (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 788-790, figs. 4*).—An apparatus for the sampling of roots, tubers, bulbs, and such fruits as are easily separated from the seeds and skins, which consists essentially of a plunger and a cylinder, the latter having a stout sieve bottom, and its manipulation are described.

The apparatus has also been found to be well adapted for obtaining raw mixtures of finely divided substance which is sterile except for such inoculations as may already exist in the interior of the material. It is indicated that, while the work has not been fully developed as yet, very satisfactory results have been obtained with ordinary precautions.

A new filter flask, J. A. SHAW (*Jour. Indus. and Engin. Chem., 9 (1917), No. 7, p. 703, fig. 1*).—An apparatus which is considered equal to the ordinary filter flask and superior to the use of a bell jar for suction filtration and its manipu-

lation are described. The flask is pear-shaped, with a wide-mouthed stopper at the bottom and a heavy glass tubing leading off to the suction pump from near the flask mouth, which is of a size suitable to take the filtering tube.

Advantages claimed for the flask are better air seals than those obtained with the bell jar type of filter, and easy removal of the filtrate and washings from the flask, thus practically eliminating the danger of contamination.

A simple improvised apparatus for hydrogen sulphid precipitation under pressure, A. V. FULLER (*Jour. Indus. and Engin. Chem.*, 9 (1917), No. 8, pp. 798, fig. 1).—The apparatus described consists of an ordinary 500-cc. K... generator provided with a two-holed rubber stopper which carries a glass stopcock and a small-bore glass tube about 3 ft. long which terminates at its upper end in a reservoir bulb of about 100 cc. capacity. The lower end of the tube extends several inches below the acid level. The gas outlet is fitted with a rubber stopper carrying a two-way stopcock. The manipulation of the apparatus is described.

It is noted that the precipitates obtained appear very granular and settle readily. The point of saturation is easily determined by rotating the flask and noting the absence of gas bubbles.

A method of ashing organic materials for the determination of potash, P. L. BLUMENTHAL, A. M. PETER, D. J. HEALY, and E. J. GOTT (*Jour. Indus. and Engin. Chem.*, 9 (1917), No. 8, pp. 753–756).—To reduce materially losses by spattering and volatilization in ashing organic material, the authors, at the Kentucky Experiment Station, have found that direct evaporation of the sample with nitric and sulphuric acids preliminary to burning off organic matter has proved the best method for securing uniform results. Simple moistening of the sample with sulphuric acid was found not to be sufficient, and enough acid must be added to oxidize the carbon and to convert all inorganic elements present to sulphates. This conversion of the potassium salt present in the material to the sulphate reduces the volatilization losses to a minimum.

Burning off the carbon in a muffle furnace yielded more uniform results than direct heating over a free flame.

The data are submitted in tabular form and discussed.

A practical revision of the cobalti-nitrite method for the determination of potash, R. C. HALE and E. H. SCHWARTZ (*Jour. Indus. and Engin. Chem.*, (1917), No. 8, pp. 785, 786).—The following revision of the procedure previously described by Bowser (E. S. R., 22, p. 510) is submitted:

To a 2-gm. sample of raw material 0.5 gm. of ammonium chlorid is added and thoroughly mixed in a mortar. Four gm. calcium carbonate is then added and the contents of the mortar further mixed and ground. The mixture is transferred to a 20 cc. platinum crucible, the bottom of which has been covered with a generous layer of calcium carbonate, usually about 2 gm., the contents of the crucible are covered with about 2 gm. of calcium carbonate, and the heating and sintering carried out as in the J. Lawrence Smith method. After the mass has been slaked in a small casserole it is placed on a hot-water plate and heated to boiling, filtered into a flat-bottomed porcelain dish, and the precipitate washed three or four times with very hot water. An excess of acetic acid (5 to 10 cc.) is added to the filtrate and the solution then evaporated on a steam bath until no odor of acetic acid remains.

The residue is taken up with a little hot water and the sides of the dish thoroughly washed. From 10 to 15 cc. of the cobalt reagent is added and the liquid evaporated on a steam bath to a pasty consistency. It is removed from the bath, cooled, and about 30 cc. of cold water added, breaking up the precipitate thoroughly. The precipitate is then filtered through an asbestos pad in a Gooch crucible, washed once with cold water, the contents of the crucible trans...

...ferred to a 400-cc. beaker containing an excess of standard fifth-normal ...ssium permanganate, and diluted to 250 cc. The beaker is then placed ... steam bath for about 15 minutes and acidulated with 10 cc. of 1:1 sul... acid, the excess permanganate is removed with standard fifth-normal ... acid, and the clear solution retitrated with standard potassium permanganate solution.

... determining "water-soluble" potash 10 gm. of the material is weighed ... 600-cc. beaker and boiled with 250 cc. of water for 30 minutes. It is ... transferred to a 500-cc. flask, cooled to room temperature, and made to the ... After shaking well, a portion of the solution is filtered through a dry ... and 50 cc. of the filtrate placed in a platinum or porcelain dish. The ... is then carried out as given above.

... directions for preparing the cobalt-nitrite solution and calculation of the potassium oxid factor are given.

... method has been used for some time and has yielded most satisfactory ... on total potash when checked against the J. Lawrence Smith method, ... on water-soluble potash when checked against the official method.

The solubility of calcium phosphates in citric acid. A. A. RAMSAY (*Jour. Soc. Chem. Ind. [England]*, *8 (1917), No. 8, pp. 277–298*).—The results of the study ... show that the materials sold as "phosphate of lime" and "Calcii ... B. P." are not tricalcium phosphate, but mixtures of di- and tricalcium phosphates. By adding disodium phosphate to ammoniacal calcium chlorid ... mixture of di- and tricalcium phosphate and calcium hydrate is obtained. ... dissolved in hydrochloric acid and precipitated with ammonia (as in ... directions for preparing tricalcium phosphate according to the British ... Pharmacopœia) also yields a mixture of di- and tricalcium phosphate and ... hydrate. When three equivalents of calcium oxid act on one equivalent of phosphoric acid and the resulting precipitate is immediately removed ... tricalcium phosphate is obtained. When two equivalents of calcium oxid ... on one equivalent of phosphoric acid the product obtained is not dicalcium phosphate, but a mixture of di- and tricalcium phosphate.

... the total phosphoric acid of pure tricalcium phosphate 91 per cent is ... in 2 per cent citric acid solution in 30 minutes, as determined by the ... adopted for the determination of "citrate-soluble" phosphoric acid. By addition of calcium carbonate to a pure tricalcium phosphate the "citrate solubility" of the phosphoric acid is reduced from 91 to 84 per cent. It is ... that the 2 per cent citric acid solution is rather a solvent for lime than ... phosphoric acid.

"Since tricalcic phosphate and dicalcic phosphate are both soluble in the ... 2 per cent citric acid solution the statement that dicalcic phosphate ... differentiated from tricalcic phosphate by means of the selective action ... solvent is untenable. It follows that the manurial value of phosphates ... not be determined by a 2 per cent citric acid solvent in the method prescribed, and it therefore is a matter for consideration whether or not the ... use of this method should be continued."

... also previous notes of Hopkins (E. S. R., 37, p. 214) and Jatindra Nath ... (E. S. R., 37, p. 615).

A method for the destruction of organic matter in animal and vegetable materials for the determination of arsenic and the examination of the ash. A. GAUTIER and P. CLAUSMANN (*Compt. Rend. Acad. Sci. [Paris], 165 (1917), No. 1, pp. 11–16*).—The procedure, which consists essentially of heating the dry, ... pulverized material with calcium oxid, is described in detail. The method ... also be used for preparing material for the determination of boric, phosphoric, and silicic acids, fluorin, nickel, silver, and copper. The procedure rec-

ommended eliminates the use of large amounts of acid ordinarily used for oxidation.

Iodometric determination of chlorin in chlorids, G. TOROSSIAN (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 751, 752, fig. 1*).—In the proposed method the sample is mixed with finely powdered manganese dioxid and treated with sulphuric acid (1:1 by volume) in a distilling flask. The chlorin produced by the interaction of the MnO_2 and liberated hydrochloric acid is distilled into potassium iodid solution and the liberated iodin titrated as usual with tenth-normal sodium thiosulphate.

Comparative analytical data with the standard silver nitrate procedure indicate the accuracy of the proposed method.

A new test for chlorin in drinking water and its application for the estimation of the chlorin present, R. L. M. WALLIS (*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 797–799*).—A colorimetric procedure which depends on the production of a yellow color in a solution of benzidine or tolidin by chlorin is described as follows:

To 100 cc. of the sample to be tested in a Nessler tube 1 cc. of a 0.1 per cent solution of benzidine in 10 per cent hydrochloric acid is added. The solution first becomes blue, but on stirring the blue color rapidly changes to a bright yellow. The mixture is allowed to stand for exactly five minutes and then compared with standards prepared under similar conditions.

The production of the color is not affected by the salts present in drinking water or other chemical reagents added for purposes of sterilization. The delicacy of the test is indicated by its being able to detect 0.005 parts per million of chlorin in drinking water.

For effective chemical sterilization of water 1 part of chlorin in 500,000 parts of water is considered necessary.

The chemical examination of potable waters.—I, Determination of organic matter, I. M. KOLTHOFF (*Pharm. Weekbl., 54 (1917), No. 22, pp. 547–553*). The addition of 5 cc. of four-normal sulphuric acid and 25 cc. of $\frac{1}{100}$-normal potassium permanganate to 100 cc. of the water sample and the determination of the excess potassium permanganate iodometrically after 24 hours is considered to be the best procedure for the determination of organic matter in potable waters and to yield satisfactory results.

A new method for the determination of aldehyde sugars, J. BOUGAULT (*Compt. Rend. Acad. Sci. [Paris], 164 (1917), No. 26, pp. 1008–1011*).—A new method for the determination of aldehyde sugars which depends on the oxidation of the aldehyde to the corresponding monobasic acid with iodin in the presence of sodium carbonate is noted. The presence of ketonic sugars does not affect the result. In mixtures containing sucrose and other nonreducing sugars the accuracy of the procedure depends on the relative proportion of the sugars present. With increasing amounts of nonreducing sugars the necessary correction increases, and so slightly diminishes the accuracy of the results. The principal disadvantage of the method indicated is the interfering action of other organic substances that are likely to be present with the aldehyde sugars.

The details of the reaction and of the method are reserved for a future communication.

The acid content of fruits, W. D. BIGELOW and P. B. DUNBAR (*Jour. Indus. and Engin. Chem., 9 (1917), No. 8, pp. 762–767*).—The following results obtained in an examination of the acids found in various fruits are reported: Apple, cherry, and plum, malic only; banana, peach, persimmon, probably malic only; cantaloup, malic none, probably all citric; cranberry, citric probably predominates, malic also present; currant, citric probably predominates, malic sometimes present; gooseberry, malic and citric; pear, malic only in some

...ges—citric probably predominates in others with small amounts of malic; ...anate, probably all citric, no malic nor tartaric; quince and watermelon, ... no citric; and raspberry (red), probably citric only—malic, if present, ...ges only. Apricots, blackberries, and huckleberries were also examined, ... definite results on their acid content were obtained.

The danger of drawing general conclusions as to the acid content of fruits ...alysis of a limited number of varieties, or even samples, is indicated as ... emphasized by the varying results obtained with pears.

A table giving results and references thereto as to the acids in various fruits ...ed by previous investigators is included.

Sources and composition of some commercial invert sugar sirups with ... on sorghum sirups, S. JORDAN and A. L. CHESLEY (*Jour. Indus. and ... Chem.*, 9 (1917), *No. 8, pp. 756–758*).—This is a general discussion of the ...ds of methods of analysis, moisture-holding properties, specifications, and ...ghum sirup. Analytical data, including invert sugar, sucrose, and ash of a ...ber of sirups collected from various sources, are submitted.

Relative value of different weights of tin coating on canned food containers (*Washington, D. C.: Nat. Canners Assoc., 1917, pp. 51+666, figs. 9*).—This is the report of an investigation by a technical committee representing the National Canners' Association, the American Sheet and Tin Plate Company, and the American Can Company. Products from various parts of the country typical of those usually canned in tin were used. In general, no great differences in the products were observed by using tins with varying weights of ...ing.

Data relative to the discoloration of cans and average tin content of various ...ults are submitted in graphical form. Other experimental and analytical ... of the investigation are reported in detail in 10 appendixes.

War food, AMY L. HANDY (*Boston: Houghton Mifflin Co., 1917, pp. IX+76, ... 3*). This small volume gives directions for drying fruits and vegetables; ...serving meat; canning with and without sugar; preparing jellies; salting; ...ing; and making cider, potato, and corn vinegar.

The evaporation of fruits and vegetables, J. S. CALDWELL (*Washington Sta. ... Bul. 148 (1917), pp. 7–111, figs. 26*).—This is in part a revision of the bulletin ...viously noted (E. S. R., 35, p. 418), with new sections discussing in detail ...e drying of cherries, berries, peaches, apricots, prunes, and various vegetables, ...ether with directions for preparing the materials for drying and for storing ... packing the dry products.

A new method for the preparation of pectin, J. S. CALDWELL (*Washington ... Bul. 147 (1917), pp. 3–14*).—A method of preparing pectin from cull apples ...other fruits rich in the substance for future use in jelly making from fruit ...ies poor in pectin is described. The method consists essentially of the separ... of a portion of the water of the juice by freezing, removal of the concentrated liquid from the ice by centrifugalization (or draining through muslin), and repetition of the process until the desired concentration has been obtained. The concentration is finally completed by evaporating the residue at a low temperature. The method has been simplified and adapted so that it may be easily carried out with very little equipment.

The concentrated extracts were found to retain their gelatination properties perfectly after long periods if the acid was removed from the juice by calcium ...onate. A tasteless and odorless dry product may be secured by precipitating the pectin from the concentrated extract by alcohol and subsequently drying at a low temperature.

Some general notes on the occurrence, distribution, and use of pectin are included.

Carbonation studies.—**I, A mechanical stirrer for carbonation direct in the bottle,** H. E. PATTEN and G. H. MAINS (*Jour. Indus. and Engin. Chem.*, *9* (*1917*), *No. 8, pp. 787, 788, figs. 2*).—An apparatus and its manipulation are described in detail.

Vinegar investigation.—**A study of the changes that cider undergoes during fermentation and prolonged storage and its subsequent conversion into vinegar in rotating generators,** B. G. HARTMAN and L. M. TOLMAN (*Jour. Indus. and Engin. Chem.*, *9* (*1917*), *No. 8, pp. 759–762*).—The results of the investigation, which extended over a period of two years, show that during fermentation a large part of the malic acid of the apple juice is destroyed to form lactic acid. During acetification the remaining malic acid is almost entirely oxidized. The fixed acid in the vinegar is chiefly lactic acid. The presence of acetates in the vinegar and indications of minute amounts of formic acid were demonstrated. Analysis of the ash showed it to contain 75 per cent of potassium carbonate.

Complete analytical data are submitted.

Preserving fish for domestic use, H. F. MOORE (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 28* (*1917*), *folio*).—This circular gives detailed general directions for canning and salting fish for home consumption.

A practical small smokehouse for fish (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 27* (*1917*), *pp. 7, figs. 3*).—This gives directions for constructing a smokehouse and cleaning, salting, and smoking the fish, and discusses the fuel used in smoking and protection from mold.

METEOROLOGY.

New methods of weather prediction, A. VOSS (*Mitt. Deut. Dendrol. Ges.*, *24* (*1915*), *pp. 138–149, figs. 2*).—The author points out certain alleged deficiencies in ordinary methods of weather forecasting, particularly from the standpoint of the farmer and gardener, and explains methods devised by himself which he thinks overcome these deficiencies.

Factors influencing the condensation of aqueous vapor in the atmosphere, A. MASINI (*Nuovo Cimento, 6. ser., 12* (*1916*), *II, No. 9, pp. 110–129, fig. 1*; *abs. in Sci. Abs., Sect. A, Phys., 20* (*1917*), *No. 235, pp. 261, 262*; *Sci. Amer. Sup., 84* (*1917*), *No. 2180, p. 238*).—Experiments bearing upon the action of ozone, nitrogen peroxid, and, indirectly, ammonia, as well as of dust, in forming condensation nuclei in the atmosphere are reviewed. The effect of electrical discharges, flames, and glowing bodies in favoring condensation is also referred to.

Ultraviolet light is not considered necessary for the formation of nuclei and functions only as a source of ozone. Gaseous ions exhibit no power to constitute condensation nuclei. "Trees, especially tall ones and those rich in resin, give rise to ozone, and should therefore favor production of rain. Opinions on the actual influence exerted by trees are, however, very variable."

The relation between forests and atmospheric and soil moisture in India, M. HILL (*Indian*) *Forest Bul. 33* (*1916*), *pp. 41, pls. 2*; *abs. in Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Sci. and Pract. Agr., 8* (*1917*), *No. 4, pp. 551–557*; *Nature* [*London*], *99* (*1917*), *No. 2492, pp. 445, 446*).—This is a report based upon replies to a letter of inquiry sent out by the Government of British India asking information regarding (1) rainfall, (2) differences in level of the underground water table, and (3) flow of rivers and streams in different parts of India.

The data obtained indicate that during the last 50 years there have been no permanent changes in the rainfall which can be directly connected with the monsoons. It appears, however, that forests may increase rainfall to a certain

...ed extent (not exceeding 5 per cent) by promoting the condensation of ... vapor. There appears to have been no change in the level of the under... water during the last 50 years, except such as depends upon the rain... Apparently in most Provinces there has been no serious damage to the ... rivers and no great injury to cultivation as a result of floods due to ... deforestation. There are, however, local exceptions, and much flood damage ... done in the Punjab, in Bengal, and in Assam.

... fall and gunfire. A. ANGOT (*Compt. Rend. Acad. Agr. France*, *3* (*1917*), ... *pp. 591–598*; *rev. in Nature* [*London*], *99* (*1917*), *No. 2493, pp. 467, 468*; ... *Sup.*, *84* (*1917*), *No. 2180, p. 227*).—This paper deals with the his... aspects of the subject, reviews the various theories advanced, and ... evidence to show that there is no causal relation between gunfire and ...

... relation between atmospheric phenomena and the yield of crops (*Rev. ... [Paris]*, *55* (*1917*), *No. 14, p. 436*).—This is a brief note on studies by ... light on the influence of precipitation on the yield of alfalfa, in which a ... was kept during 10 years of the spring rainfall and of the yield of the ... The coefficient of correlation was found to be 0.49 for the particular ... and place in which the studies were made.

... observations in the British Islands. J. E. CLARK and H. B. ... (*Quart. Jour. Roy. Met. Soc.* [*London*], *43* (*1917*), *No. 183, pp. 285–316*, ...). Observations from December, 1915, to November, 1916, at 117 stations ... plants, birds, and insects are summarized. Tentative isophenal lines ... similar to those of Ihne for Continental Europe are shown for several ... plants for periods of 120 (April 29), 130 (May 9), and 140 days (May ... the British Isles. The usual data for farm crops are not included, ... the status of farm work and crops at different dates is noted.

... studies.—German East Africa, H. G. LYONS (*Quart. Jour. ... Met. Soc.* [*London*], *43* (*1917*), *No. 182, pp. 175–195, pls. 8, figs. 5*).—This ... is based upon observations covering the 20 years from 1892 to 1911.

"On account of its position close to the equator most of the colony receives ... tropical rains in the wet season, while the drier northeasterly and south... air currents of northern and southern Africa, respectively, sweep over ... give rise to dry seasons which are in some parts of several months' ... and of considerable aridity." Seasons, as understood in the Temperate ... do not exist, but instead there is an alternation of the dry season and the ... season which divides the year and determines the cycle of agricultural ... The coastal region, as a result of air currents from the Indian ... has a heavier rainfall than many parts of the interior.

... climatic variations as occur are largely those due to the physical charac... the country. The climatic conditions of each district are discussed in ... detail with reference to vegetation.

SOILS—FERTILIZERS.

... soil solution obtained by the oil pressure method, J. F. MORGAN (*Soil ... (1917), No. 6, pp. 531–545*).—Experiments at the Michigan Experiment ... with the paraffin oil displacement-pressure method are reported. In ... this method the solution is displaced by forcing paraffin oil by pressure through ... soil.

... was found that "the paraffin oil pressure method furnishes in most cases ... of solution for the necessary analytical work. In sandy soils as high as ... per cent of the moisture present in the soils was obtained. A large amount

of solution may be obtained without its coming in contact with the oil. If so, does it can be easily separated by cooling and by the separatory funnel.

"The concentration of the soil solution from different samples of the same type of soil varies according to the moisture content of the samples from which it is derived. Successive portions of the same extraction vary only slightly in their physical properties, but to a considerable extent in the various forms of nitrogen. The forms of nitrogen vary in the different solutions. . . . Calcium and magnesium also vary according to the treatment and reaction of the soil. The phosphoric acid is fairly constant. Potash varies somewhat. A small percentage of the bacteria are removed from the soil, since the soil acts as a filter. Anaerobic changes take place in the cylinder if it is allowed to stand for a long time.

"The paraffin oil displacement-pressure method furnishes . . . a fair representative of the solution as it exists in the soil. The method permits the use of a large amount of soil, thus a better representative sample. Work now in progress indicates that it furnishes a valuable index of the microbial changes in the soil."

Is the humus content of the soil a guide to fertility? R. H. CARR (*Soil Sci., 3 (1917), No. 6, pp. 515–524, figs. 3*).—Experiments conducted at Purdue University using a surface clay soil very deficient in organic matter and different organic manures are reported.

"The results of the vegetation and humification tests seem to show that whenever there is rapid humification of manure the growth of the plant is greatly stimulated, indicating that 'the decay of organic matter is desirable in plant growth and not just its mere presence.' This was especially noticeable when green manures were rolled under and limed as compared with disking or mixing the manures uniformly with the soil.

"Certain of the manures seem to be as soluble in a 4 per cent ammonia when just mixed with the soil as after humification. This was found to be true with alfalfa and steer and somewhat with cow manures. Horse manure seemed to humify slowly and its plant food was largely unavailable to corn during the first year, but the humification and vegetation tests show it becomes more available in the second year. It was possible to increase the rate of humification of horse manure in the first year by adding dolomitic limestone, which resulted in a greater yield of corn than where humification had not taken place.

"The organic residues left in the soil from manure treatment were not very effective during the second year in producing a growth of corn, probably because the most available or valuable complexes had disappeared in the first year. There is no apparent relationship between the percentage of ash in humus and the growth of corn. The humification and vegetation tests seem to indicate a rather close relationship between the amount of humus and the growth of corn."

Effect of the addition of organic matter to the soil upon the development of soil acidity, M. F. MILLER (*Missouri Sta. Bul. 147 (1917), pp. 50, 51*).—The results reported in general indicate "that the ordinary green manures turned under either dry or fresh do not increase soil acidity, although a crop containing much sugar, as in the case of sorghum, does appreciably increase soil acidity for a few weeks. This acidity later decreases."

Is there any fungus flora of the soil? S. A. WAKSMAN (*Soil Sci., 3 (1917), No. 6, pp. 565–589*).—Studies at the New Jersey Experiment Stations of the fungus content of 25 soils collected under sterile conditions from different parts of North America and the Hawaiian Islands are reported.

Over 200 species of fungi were isolated. It was found that the more fertile soils contained more fungi, both in number and species, than the less fertile

soils. The soils of the cooler climate seemed to contain a greater number of Mucorales and Penicillium, while those of the warmer climate were more abundant in Aspergillus. The acid and water-logged soils were richer in numbers and species of Trichoderma than normal agricultural soils.

Biological variations in soil plats as shown by different methods of sampling, F. E. ALLISON and D. A. COLEMAN (*Soil Sci., 3 (1917), No. 6, pp. 505, figs. 2*).—Experiments conducted at Rutgers College to determine the influence of method of sampling soils on biological variations are reported. Two one-twentieth acre plats, one of heavy clay growing timothy sod and the other of sandy loam growing corn, were used. Samples were taken by the Brown method (E. S. R., 28, p. 120) and by the Lipman sampling tube (E. S. R., 14, p. 556).

The data obtained led to the belief that "where plats are uniform in character the biological variations of the soil at different points in the plat are not great or else we are not able to detect these differences by the present methods. The tube method is superior to Brown's method both for ease of taking the sample and from the standpoint of destruction of the plat, especially in an uncultivated area."

The effect of sterilization of soils by heat and antiseptics upon the concentration of the soil solution, G. P. KOCH (*Soil Sci., 3 (1917), No. 6, pp. 527–539*).—Experiments conducted at Rutgers College to determine the influence on the concentration of the soil solution of commercial sterilization as practiced in greenhouses, sterilization as used in biological laboratories, and of the presence of organic matter during the process of sterilization are reported. The following conclusions were drawn:

"The lowering of the freezing-point method is a satisfactory means of determining soil solution concentration as influenced by sterilization. In commercial as well as laboratory methods of steaming soils, the heavier soils are more influenced by sterilization than lighter soils. Steaming alone was more effective in increasing the concentration than . . . the formalin treatments.

"Applying formalin (1:50) and then steaming at 10 lbs. pressure increased the concentration more than any other method tried. By this method the concentration was increased to three times the original concentration of the soil solution. A considerable amount of soluble material is leached out of the soil, and thus the concentration is lowered if the quantity of antiseptic solution applied is so great that the soil can not hold it against the force of gravity. . . .

"Sassafras loam and . . . Penn loam soils were affected in the laboratory sterilization method so that the concentration was increased 0.24 and 0.3 atmosphere respectively. The concentration of . . . Norfolk sand containing a very small amount of organic matter was not affected so that it could be detected by the method employed. One per cent of dried blood increased the concentration of the soil solution of . . . Norfolk sand 0.09 atmosphere, while 2 per cent cottonseed meal increased the concentration three times this amount."

Some effects of organic growth-promoting substances (auximones) on the growth of Lemna minor in mineral culture solutions, W. B. BOTTOMLEY (*Proc. Roy. Soc. [London], Ser. B, 89 (1917), No. B 621, pp. 481–507, pls. 2, figs. 3*).—Experiments on the influence of extracts of bacterized peat on the growth of *L. minor* plants in mineral culture solutions showed that "the addition to the mineral culture solution of 368 parts per million of organic matter from the water extract of bacterized peat resulted, after six weeks, in a multiplication of the number to 20 times, and an increase in weight to 62 times, that of the control plants. The water extract free from humic acid, representing an addition of 97 parts of organic matter per million, gave 9½ times the number and 20 times the weight; 32 parts per million from the alcoholic extract

gave 3½ times the number and 7½ times the weight; 13 parts per million from the phosphotungstic fraction gave 1½ times the number and 2½ times the weight.

"The effect of the reduction in amount of auximones with successive fractionation of the bacterized peat was also manifest from the general appearance of the plants. Those in mineral nutrients only decreased in size week by week, and became very unhealthy in appearance, while there was a progressive improvement in the appearance of the plants supplied with increasing amounts of auximones. Those receiving the larger amounts retained their normal healthy appearance throughout the experiment and increased in size.

"The beneficial effect of the auximones was not due to a neutralization of the toxic substances present in the ordinary distilled water, since comparable results were obtained with conductivity water. An interchange of culture solutions, with and without auximones, showed that the plants are very sensitive to the presence or absence of these substances. It is suggested that some of these growth-promoting substances may act directly as organic nutrients and others may be of the nature of accessory food substances."

Du Page County soils, C. G. HOPKINS, J. G. MOSIER, E. VAN ALSTINE, and F. W. GARRETT (*Illinois Sta. Soil Rpt. 16 (1917), pp. 56, pl. 1, figs. 8*).—Du Page County is located in northeastern Illinois within the late Wisconsin glaciation. The topography varies from rolling to slightly undulating. The natural drainage is said to be poorly developed.

The soils of the county are divided into upland prairie soils, rich in organic matter, upland timber soils, terrace soils, late swamp and bottom-land soils, and miscellaneous types. Of these the brown silt loam upland prairie soil covers 59.95 per cent, the yellow-gray silt loam upland timber soil, 20.65 per cent, and the black mixed loam bottom-land soil, 12.01 per cent of the area.

It is pointed out that the soils of the county vary widely in content of fertility constituents. "The deep peat contains in the plowed soil of an acre 18 times as much nitrogen as yellow silt loam, and about 5 times as much nitrogen, but only one-eighth as much potassium as brown silt loam. The total supply of phosphorus in the surface soil varies from 760 lbs. per acre in the yellow silt loam to 2,360 lbs. in the black clay loam. The amounts of magnesium and calcium vary from about 1,000 to 5,000 lbs. in some types to more than 20,000 lbs. in others. Some types contain an abundance of limestone; others are practically neutral or slightly acid; and still others, such as the yellow-gray silt loam and the brown sandy loam, are acid in the surface and more strongly acid in the subsurface, but sometimes contain an abundance of limestone in the subsoil. More than 90 per cent of the soils of the county contain no limestone in the surface or subsurface to a depth of 20 in."

Soil survey of Dickey County, N. Dak., T. M. BUSHNELL, E. H. SMIES, W. I. WATKINS, A. C. ANDERSON, M. THOMAS, M. E. STERBINS, R. C. DONEGHUE, and J. W. INCE (*North Dakota Sta. Bul. 121 (1917), pp. 5–56, pls. 2, fig. 1, map 1*).—This survey has been previously noted (E. S. R., 36, p. 421).

Sand devastation, P. COLLINS (*Sci. Amer. Sup., 83 (1917), No. 2157, pp. 282, figs. 12*).—Information on how sand dunes advance and how their movement is checked is given.

The improvement of the poor soils and run-down soils of New Jersey, J. B. R. DICKEY (*N. J. Agr. Col. Ext. Bul., 1 (1917), No. 11, pp. 31, figs. 2*).—This is a brief general statement of methods of improving and maintaining soil fertility, with special reference to the poor and run-down soils of New Jersey.

Manure and artificial fertilizers for peat soil poor in nitrogen, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 30 (1916), No. 5–6, pp. 409–[illegible], figs. 7*).—Eleven years' experiments with manure and artificial fertilizers

...ish peat soil deficient in nitrogen showed that manure alone did not give ...l results but that excellent results were obtained with artificial fertilizers. ... concluded that manure should be used on such soils only in moderate ... to stimulate bacterial action, while plant nutrients should be supplied ... use of artificial fertilizers. Manure also gave poor results on white ... soil previously treated with phosphates and potash.

American sources of nitrogen, T. H. NORTON (*Sci. Amer., 116 (1917), No. 16, p. 376, 410, 411, figs. 4*).—This is a review of the present situation with reference to the economic production in the United States of combined nitrogen for ...ry, agricultural, and industrial needs.

The production of sulphate of ammonia for 1915–16 (*New York: The Bar-...t Co., pp. 16, pl. 1, fig. 1*).—This pamphlet summarizes data on the produc-... of ammonium sulphate in the world during 1916, but states that no figures ... been available from Germany since 1913. The production in the United ...s for 1916 is estimated at 325,000 tons, an increase of 30 per cent over the ...re for 1915. Of this production 272,000 tons are credited to coke ovens ...(53,000) tons to gas works and bone carbonizing plants. The consumption ...all forms of ammonia in the United States totaled 315,124 tons in 1915 and ...,708 tons in 1916.

Adsorption of ammonium sulphate by soils and quartz sand. Preliminary ...mmunication, M. I. WOLKOFF (*Soil Sci., 3 (1917), No. 6, pp. 561–564*). A ...mmary of the results of experiments at Rutgers College is reported on the ...orption of ammonium sulphate solutions of 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, ...28, and 1/256 normal concentrations by medium sandy loam, medium loam, ...um silt loam, heavy silt loam, shaley loam, muck, and quartz sand passing ...0, and 124 mesh and 5/0 and 7/0 bolting cloth.

The results in general showed that with the increase in concentration of the ...monium sulphate solution the percentage of adsorption decreased, while the ...ute amount of salt that went out of solution increased. The quartz sand ...not wholly follow the general rule, as did the agricultural soils, for instead ...the decrease of the concentration of the salt solution on its addition to the ...s concentration became greater. This phenomenon was most pronounced ...the coarse quartz sand and diminished with the increase in the fineness of the ...terial. Also the effect was more noticeable in the more concentrated solu-...s than in those less concentrated. In the finer grades of the quartz treated ...the comparatively dilute solutions the point was reached after which the ...ntration of the resultant solution in the mixture with sand was less than ...of the original solution. After a certain point, which evidently is specific ...a given quartz sand, the quartz sand followed the same general rule that ...s below. In the case of the coarse sand which is designated as 24-mesh the ...ression of the salt solution after application was greater in every instance ...the depression of the freezing point of the solution before application. ...centage of the increase in depression, however, gradually decreased with ...ution of the applied solution. With the finer grade of the quartz sand ...sed in the first three concentrations there was a striking similarity to the ...s obtained with the coarsest material. But beginning with the concen-...n 1-32-normal, there was an adsorption of the salt by the quartz sand, ...centage of this adsorption increasing with the dilution of the solution.

The results tend to show that the heavier the soil the greater is the amount ...the salt adsorbed. The time in which the soil is allowed to be acted upon ...the salt solution influences the percentage of the salt adsorbed. In the light ...d soil the maximum adsorption was reached in about 24 hours, while in ...heavier type this point occurs after as many as 72 hours. The temperature ...0 to 31° C. at which the reaction is allowed to proceed affects the degree

of adsorption, this being greater at the higher temperature in a given time than at the lower one. The presence of the organic matter in the form of dried blood, cottonseed meal, alfalfa, barley straw, or wheat straw affects the adsorption of ammonium sulphate in the soil. Moreover, the application of these materials alone increases the concentration of the soil solution."

Saltpeter: Its origin and extraction in India, C. M. HUTCHINSON (*Agr. Research Inst. Pusa Bul. 68 (1916), pp. 24, pls. 4*).—The methods in use by the natives of India for the extraction of nitrate salts from soils and organic matter are described. It is pointed out that the present sources of saltpeter are not fully utilized on account of the native methods used and the low price of saltpeter. The native methods do not allow of recovery of all the nitrate present in the soil used. It is thought probable that owing to the favorable soil and climatic conditions in Bihar, artificial niter beds would form a useful additional source of nitrate.

Potash from incinerator ash of the Northwest, C. W. THING (*Jour. Indus. and Engin. Chem., 9 (1917), No. 5, pp. 472–474*).—Experiments conducted at the University of Washington on the extraction of potash from the ash of the burner waste from the lumber industry are reported. The following conclusions are drawn:

"Potash production from incinerator ash can not be put on a paying commercial basis . . . because of (1) low potash content, (2) higher cost of production, (3) insufficient supply of raw material. Unless a new method for the disposal of waste is suggested, the prevailing method of disposal of incinerator ash is as economical as can be found. Analyses show it to be of little value for fertilizer. If any plan were to be suggested for the successful production of potash from wood ashes, it must fulfill the following conditions: (1) Dispose of the waste as fast as it is produced; (2) operate at low temperatures and with slight draughts; (3) successfully meet foreign and domestic competition."

Tetraphosphate, G. VINASSA (*Staz. Sper. Agr. Ital., 49 (1916), No. 7–8, pp. 357–365; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 10, pp. 1419, 1420*).—A new phosphatic fertilizer called tetraphosphate is described, which has been recently put on the market as a substitute for basic slag. It is prepared by mixing powdered phosphorite with carbonates of the alkaline earths, at the rate of 6 per cent by weight of the carbonates, and heating the mixture to 100° C. in special ovens. The mass is then moistened and inert bodies are added until a substance containing 20 per cent total phosphoric acid is obtained. The finished product is a dry grayish-white powder almost insoluble in water, with which it gives an alkaline reaction, and partly soluble in acids which cause an evolution of carbon dioxid.

Tetraphosphate was treated with a number of solutions, including water, water saturated with carbon dioxid; sodium chlorid and nitrate; ammonium chlorid and sulphate; 18 per cent ammonium acetate; 40 per cent ammonium malate; 20 per cent ammonium tartrate; 40 per cent ammonium citrate; 0.5, 2, and 10 per cent citric acid; and a mixture of 4 per cent citric acid, 6 per cent formic acid, and 10 per cent sodium chlorid. Similar tests were conducted with Sfax phosphorite. The solution of citric and formic acids and sodium chlorid was proposed as a suitable reagent for tetraphosphate, but indicated a larger percentage of soluble phosphoric acid in phosphorite than in tetraphosphate. The same result was obtained with all the other solvent solutions.

"These results would indicate that no valuable changes take place when the phosphorite is heated with the carbonates of the alkaline earths, and that the process, which is complicated and costly, is also useless. The name tetraphosphate is very inappropriate, as its insolubility clearly proves it to consist

...r tetraphosphate nor calcium silicophosphate, both of which products ... been isolated from basic slag. From the purely chemical point of view, ... no analogy between basic slag and tetraphosphate, which may be ... considered a ground phosphate mixed with inert compounds."

Basic slag as affecting agricultural development, D. A. GILCHRIST and H. ... (*Jour. Soc. Chem. Indus., 36 (1917), No. 5, pp. 261–264*).—This is a re... of experience in Europe and the United States on the use of basic slag ... rock phosphate for fertilizer, special attention being given to the difference ... between the citrate solubilities of the basic slag derived from the Bessemer ... process and of that derived from the English basic open hearth process.

The conclusion is drawn that "citric solubility is certainly not the only ...terion, and is apparently not even a reliable criterion, of the value of phos... material as a manurial agent. It is therefore submitted that total ... acid content is a far more reliable test of manurial value, and ... the further advantage that it depends on the definite analytical de... of a substance, instead of being an empirical test liable to be ... by the conditions and methods of its application, and that it should ... fore be authoritatively substituted for the citric solubility test throughout ... country. This change would not only render available for the use of ... agriculturists an annual amount which may reach up to 100,000 tons ... phosphoric acid, most of which is now merely a troublesome waste product, ... and at the same time render valuable assistance to the steel trade of ... country."

The liming of limy lands, A. H. ROSENFELD (*Internat. Sugar Jour., 19 ... No. 221, pp. 209–213*).—Experiments conducted at the Tucumán Experi... Station in Argentina with lime on typical sugar cane soils which were ... fine, but low in carbon dioxid are reported. Unslaked lime was ap... at the rate of 1,600 kg. per hectare (1,424 lbs. per acre). It was found ... the cane crops on the limed plats were 5 tons per acre greater than on ... limed, the cane sprouted better, and the average weight of the stalks for ... years was almost 10 per cent better.

Rules and regulations for the enforcement of the lime-barrel act, S. W. ... (*U. S. Dept. Com., Bur. Standards Circ. 64 (1917), pp. 6*).—The text ... these regulations, which should be of interest to users of agricultural lime, ... given.

The fertilizer value of city wastes.—II, Garbage tankage. Its composi..., the availability of its nitrogen, and its use as a fertilizer, P. J. ... (*Jour. Indus. and Engin. Chem., 9 (1917), No. 5, pp. 513–518*).—In a ... contribution to the subject (E. S. R., 36, p. 728) studies on the com... of garbage tankage, the availability of its nitrogen, and its fertilizer ... are reported.

The examination of various garbage tankages "revealed no important fact ... shows that they are unsuited for fertilizer material. The position is not taken ... is possible to determine the value of a fertilizer material definitely by ... methods of chemical analysis, but from the examination the expecta... would seem entirely justified that the proper use of garbage tankage should ... the usual results obtainable from medium or low-grade fertilizers."

Turf bedding and compost, I. I. VIKHLIAEV (*Torfianaia Podstilka i Kom... Petrograd: Glav. Uprav. Zeml. i Zeml., Otd. Zemel. Uluch., Torfmeisterak. ... 1915, pp. 50, pls. 2, figs. 19*).—A review is given of experience with turf ... moss as a bedding for cattle and horses and as a manure.

The best material was young, not greatly decomposed, mossy turf. Sphag... was also good for this purpose. Air-dried moss, frozen while damp, made

excellent bedding with very little dust. It was found to be very absorbent both of water and gases, destroyed disagreeable stable odors, and made an excellent small-grained manure which was easily and uniformly spread under the plow. Compressed turf was also found to be cheaper, occupy less storage space, and to be less dangerous as regards fire than straw. The resulting manure was found to contain from 0.5 to 1 per cent of nitrogen, 0.2 per cent of phosphoric acid, 1.3 per cent of sulphuric acid, 0.2 per cent of potash, 1.2 per cent of calcium, and 2.1 per cent of magnesium.

Artificial fertilizers, their present use and future prospects, E. J. Russell (*Jour. Soc. Chem. Indus., 36 (1917), No. 5, pp. 250-261, fig. 1*).—The author reviews the commercial fertilizer situation, dealing especially with the general production and use, manner of use, and results obtained therefrom in Europe under war-time conditions.

The American fertilizer handbook (*Philadelphia: Ware Bros. Co., 1917, 1. ed., pp. [4]4, figs. 10*).—This handbook contains the usual data and information relating to the fertilizer industry (E. S. R., 36, p. 124). Among the more important special articles included are the following: Dictionary of Fertilizer Materials, by T. C. Pinkerton; The Sulphuric Acid Industry, by A. M. Fairlie; Sulphate of Ammonia Statistics; Fertilizers and Farm Efficiency, by J. W. Hencroth; Use Fertilizers to Keep More Stock, by S. B. Haskell; Sulphur, by P. S. Smith; Potash Salts; 1915, by W. C. Phalen; and Potash, 1916, by H. S. Gale.

Commercial fertilizers, W. J. Jones, jr., E. G. Proulx, R. B. Deemer, R. O. Bitler, and H. C. Mugg (*Indiana Sta. Bul. 199 (1917), pp. 3–114, figs. 2*).—This is the report of official fertilizer inspection and analyses in Indiana for 1917, including information on the selection, purchase, use, and home mixing of fertilizers.

Results of fertilizer inspection, spring season 1917, A. J. Patten (*Michigan Sta. Circ. 33 (1917), pp. 3*).—This is the report of fertilizer inspection and analyses in Michigan for the spring season of 1917. "Of the 518 samples analyzed, 135 (26 per cent) were found to be below guaranty in one or more constituents and 92 (17.8 per cent) were below guaranty in potash."

AGRICULTURAL BOTANY.

Matroclinic inheritance in mutation crosses of Œnothera reynoldsii, O. E. La Rue and H. H. Bartlett (*Amer. Jour. Bot., 4 (1917), No. 3, pp. 113–141, figs. 4*).—This paper is concerned primarily with the type of inheritance previously discussed (E. S. R., 35, p. 128) as mass mutation.

It has been found that the mutations characteristic of mass mutation in *Œ. reynoldsii*, when crossed either way among themselves or with the pure form, give progeny conforming exactly to the type of the pistillate parent. The author states that in *Œ. reynoldsii* mass mutation consists in the production in inordinate numbers of mutations of several characteristic types by certain individuals which may be looked upon as having undergone a premutative modification. Their production of a large number of abortive seeds is regarded as one manifestation of mutability. The characteristic mutations form a series each member of which may give rise to a succeeding member, such a series being that formed by the mutants *semialta*, *debilis*, and *bilonga*.

The observed facts of inheritance are supposed to be best explained by the hypothesis that two types of nonequivalent gametes, designated as α and β, are normally produced, the α gametes being usually eggs and the β gametes sperms, the mutant *bilonga*, however, producing both α and β sperms. Mutation in *Œ. reynoldsii* consists in the modification in α gametes of factors

have no counterpart in the β gametes. Sperms of the form *typica* being ... mutations appear whenever a mutated α gamete is fertilized. They ... appear as a result of segregation.

A new type of non-Mendelian variation in plants, S. IKENO (*Bot. Mag. Tokyo, 29 (1915), No. 346, pp. 216–221, fig. 1; abs. in Ann. Bot. [Rome], 14 (1916), No. 2, p. 109*).—The author reports having found in heredity tests with *Pisum annuum* that variegation was transmitted from either parent or ... The numbers produced, however, were smaller when variegated plants were crossed with green than with variegated ones, the Mendelian formula ... applying in these results.

The relation between evaporation and plant succession in a given area, ... GATES (*Amer. Jour. Bot., 4 (1917), No. 3, pp. 161–178, figs. 9*).—Experimentation was carried on during the summers of 1915 and 1916 with 42 standard atmometers, employing the usual methods. Owing to the smallness of the ... covered the influence of edaphic factors was not obscured by the operation ... and climatic factors.

Invasion, the initial stage of succession, must take place, it is claimed, under the conditions already existing. A change of conditions coincident with mesophytic succession may result in a decrease in the rate of evaporation in the ... or chamæphytic layer. Evaporation differences are due to the size ... density of the surrounding vegetation. While a decrease in the evaporation ... a prerequisite to succession, a change in the dominant species of an area ... fundamental thereto. The change in evaporation is a result and not a cause ... succession. While certain species develop under existing conditions to bring ... succession, species of narrower physiological limitations can not develop ... the conditions come within their range. These are secondary species, unable cause succession, the occurrence of which requires the arrival and development of the dominant species of a higher genetic association.

Adaptations of vegetation to climate, J. MASSART (*Ann. Géogr., 26 (1917), No. 146, pp. 94–105, pl. 1*).—This is an account of the conditions and behavior noted in a study of vegetation in portions of France which are subject to somewhat exceptional climatic and seasonal influences and changes. It is stated that each function in the economy of the plant, as germination, growth, rosette formation, etc., has its optimum temperatures lying within limits which are more or less narrow according to species, and that in order to understand the adaptation of a plant to heat (as an example of influential climatic elements) it is necessary to study the plant in all the successive phases of its life and in relation to the various exigencies to which it is normally subjected.

Temperature and life duration of seeds, J. F. GROVES (*Bot. Gaz., 63 (1917), No. 3, pp. 179–189, figs. 5*).—Employing Turkey red wheat, the author has sought to determine to what extent a study of the life duration of seeds at high temperatures (50 to 100° C.) will explain the process of degeneration of air-dried seeds at ordinary storage temperatures. The life durations of wheat with 9, 12, and 17.5 per cent moisture are given for various temperatures, and the degree of application at high temperatures of the Lepeschkin formula (E. S. R., ... 27) is indicated.

A definite trend appears in the value of the temperature coefficient Q_{10} (symbol of the Van't Hoff law), and its range is confined to rather narrow limits. ... that there is no justification for placing much emphasis on predicted ... at low temperatures.

... work indicates some of the possibilities of throwing light on the nature ... processes of the loss of viability in seeds in storage conditions, and it ... possible a quantitative statement of the significance of storage condi-

tions, especially moisture content and temperature as regards the longevity of seeds.

Duration of leaves in evergreens, VINNIE A. PEASE (*Amer. Jour. Bot.*, *(1917), No. 3, pp. 145–169, figs. 13*).—Observations by the author in the western part of the State of Washington show that leaf persistence varies among evergreens from about 2 to 23 years. It is influenced by age and habitat, being shortened in saplings, by sunshine, on windward coasts, and in moist climates. Peat bogs show an influence similar to that of dry climate in the retention of leaves. Increased duration of leaves corresponds to such factors as the slowness of growth, also decrease of leaf surface and of photosynthetic and transpiring activity. It is considered as possible that variations in leaf duration in a given species may be due to differences in transpiration or photosynthetic activity caused by a difference in age or habitat.

The reaction of plant protoplasm, A. R. HAAS (*Bot. Gaz., 63 (1917), No. 3, pp. 232–235*).—Determinations of the actual and total acidity of a number of plant tissues are said to have shown that there is no constant relation between the two. Great variations occur in different portions of the same plant, in one case (that of cranberry fruits) showing an actual acidity of 4/1,000-normal in the living cells.

The mode of action of plant peroxidases, G. B. REED (*Bot. Gaz., 62 (1916), No. 3, pp. 238–238, figs. 2*).—Having followed up the work previously noted (E. S. R., 35, p. 713), the author reports on a study of the very active ferment of horse-radish obtained after soaking the finely chopped tissue in water for 24 hours.

The results, as detailed and shown in graphical form, are considered to indicate that just as colloidal platinum is recharged with oxygen by hydrogen peroxid as soon as some of the oxygen has been removed by a reducing agent, so the horse-radish peroxidase is recharged by hydrogen peroxid under similar conditions. A study of potato peroxidase gave similar results. It is thought that in such oxidation processes the peroxidase combines with oxygen to form an intermediate compound which is a more energetic oxidizing agent than the original source of the oxygen, the final stage in the oxidation being that effected by this intermediate compound. It is thought that this throws an important light on the difficult question of the mechanism of oxidation in living tissues.

The supposed action of potassium permanganate with plant peroxidase, H. H. BUNZEL and H. HASSELBRING (*Bot. Gaz., 63 (1917), No. 3, pp. 225–228*).—The authors describe experimentation and other data which are considered to indicate that the conclusions drawn by Reed, as above noted, are too sweeping for the experimental grounds upon which they are based. The oxidation phenomena observed by that author are thought to have been brought about by the action of manganese peroxid and not by activated plant peroxidases.

The response of plants to illuminating gas, SARAH L. DOUBT (*Bot. Gaz., 63 (1917), No. 3, pp. 209–224, figs. 6*).—The author, studying the effects of illuminating gas on flowers, potted plants, and root systems of a number of plants, found that certain ones named were injuriously affected by proportions of gas far below the limits of perceptible odor. An ethylene content corresponding to that of ordinary illuminating gas gave unfavorable results with several species. Some were not materially injured unless the odor was noticeable, and two were very resistant to gas. Lists are given of plants injured by gases in the soil, with forms of injury suffered by them.

Young trees at least may be injured by leakage of gas imperceptible to the senses, the foliage showing no indication of injury above ground. The killing of trees by gas is thought to be a slow process, sometimes requiring more

It appears that a perceptible odor of gas near trees is a certain indication that they are being injured.

Protection resulting to greenhouse crops and soil from escaping illuminating gas, G. P. STONE (*Florists' Ex. [2]* (*1916*), *No. 2, pp. 61, 85, fig. 1*).—Cases are cited in which illuminating gas was known to travel for considerable distances through frozen soil or more or less impervious strata, or to escape otherwise and injure vegetation in ways which are described, even when the concentrations were hardly, if at all, noticeable to the sense of smell. Roses are extremely sensitive to gas poisoning, and Easter lilies are greatly stunted thereby. Gas from the soil may be taken up by water and carried to plants some distance away. Water gas may be injurious if abundant, and certain paints give off gases which are injurious. On the other hand, certain gases in low concentrations are stimulating to growth.

A plan is presented for the protection of plants near a leaking pipe, consisting of a covering like an inverted trough for the gas main and connecting pipes to carry the gases to the open air, where they do comparatively little damage.

Leaf nectaries of Gossypium, E. L. REED (*Bot. Gaz., 63* (*1917*), *No. 3, pp. 231–234, pls. 2, fig. 1*).—The author describes certain nectar glands found on the midrib and other principal veins of leaves of *G. hirsutum*.

On the formation of nodules in the cortex of Hevea brasiliensis, G. BRYCE (*Dept. Agr. Ceylon Bul. 28* (*1916*), *pp. 23*).—Giving a somewhat detailed account of nodular and related structures in *H. brasiliensis*, the author states that such nodules are produced as the result of an alteration in the content of the latex vessels. This has not been referred to any parasitic organism and is thought to be due to physiological changes in the latex, certain trees showing predisposition to develop this condition on tapping. Four types of nodule are described.

Nodular shoots are to be distinguished from nodules, being formed by the growth of latent buds and never forming a core or the large masses of woody tissue sometimes resulting from nodule growth.

Nodules formed around altered latex vessels do not appear on trees that have not been tapped. These structures are formed on Hevea both in its native habitat and in plantations. The condition is not infectious.

Preliminary observations on the distribution of certain hymenomycetes and on their probable relation to the ectotrophic mycorrhiza of phanerogams, E. PEYRONEL (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 26* (*1917*), *I, No. 5, pp. 326–332*).—Some details are given of associations, so far as observed, between hymenomycetous fungi and woody forest plants of various species having ectotrophic but not endotrophic mycorrhiza.

Studies in the physiology of the fungi.—III. Physical properties of wood in relation to decay induced by Lenzites sæpiaria, S. M. ZELLER (*Ann. Missouri Bot. Gard., 4* (*1917*), *No. 2, pp. 93–104, pls. 16, fig. 1*).—The author follows up the previous report (E. S. R., 37, p. 129) with an account of preliminary experiments regarding the effects of *L. sæpiaria* on wood of *Pinus palustris*, *P. taeda*, and *P. tæda*, including a review of observation and opinion by others.

He concludes that resin is no safe or practical index of the durability of the three species of yellow pine investigated, except as its presence tends to exclude moisture, which is favorable to the fungi. High specific gravity of the heartwood, on the other hand, materially increases resistance to these fungi on all three pines. Specific gravity can be somewhat reliably estimated from the proportion of the summer wood to the spring wood. The width of the growth rings furnishes a further index of durability, which is greater in case of the narrower rings. Age, or distance from the central pith, shows no relation to dura-

bility up to 8 in. in radius. Sapwood decays irrespective of resin content, specific gravity, width of annual rings, or species.

The practical conclusion drawn is that specifications for great durability should be based on a judicious combination of high specific gravity, large number of rings per inch, and small percentage of sapwood present. The most durable timber is that showing broad bands of summer wood and narrow bands of spring wood as seen in the cross section.

Studies in the physiology of the fungi.—IV. The growth of certain fungi in plant decoctions, preliminary account, B. M. Duggar, J. W. Severy, and P. Schmitz (*Ann. Missouri Bot. Gard.*, 4 (*1917*), *No. 2, pp. 165–173, figs. 4*).—Employing standardized decoctions, with or without additions as given, the authors have made a study of fungi with somewhat different habits of growth, employing for this purpose *Macrosporium commune*, *Aspergillus niger*, *Glomerella* (*Gloeosporium*) *gossypii*, and *Penicillium expansum*. The results for each fungus are plotted and discussed.

The addition of sugar, nitrate, and phosphate gave in every case, except with Glomerella on bean decoction, an increase in growth over the addition of water alone. The next highest growth was obtained in most cases when sugar and nitrate were added. The changes produced in the hydrogen ion concentration due to the growth of the fungi are also indicated.

Microorganisms in silage, G. M. Reed and Lena Barber (*Missouri Sta. Bul. 147 (1917), p. 29*).—Twenty-two different species of fungi are reported to have been identified from 15 samples of moldy silage. *Penicillium italicum* was the species most commonly found, while *P. roqueforti*, *Mucor circinelloides*, *Rhizopus nigricans*, and *Oidium lactis* were found in the order named. All of these fungi were isolated from silage that had been reported as injurious to stock as well as from silage that was entirely harmless. No evidence was obtained indicating clearly the connection of *Aspergillus fumigatus* with stock poisoning from moldy silage.

FIELD CROPS.

General agriculture, P. Dieffoth (*Agriculture Générale. Paris: J. B. Baillière & Sons, 1917, vol. 2, 4. ed. rev. and enl., pp. 552, figs. 276*).—A revised and enlarged edition of the work by the same author, previously noted (E. S. R., 31, p. 1032).

Agronomical investigations [at the Guam Experiment Station, 1916], A. C. Hartenbower (*Guam Sta. Rpt. 1916, pp. 6–25, pls. 4*).—This reports the continuation of work previously noted (E. S. R., 35, p. 829), including improvement work with corn and field tests with cotton, rice, tobacco, leguminous forage crops, Kafir corn, feterita, milo maize, and grasses.

Seedlings of the Yellow Dent and Chisholm varieties of corn from Texas failed to set ears, while a white variety from Hawaii produced a few small inferior ears.

In 1915 Gila, an Egyptian cotton, and Columbia and Covington-Toole, Upland types, were heavily pruned and left in the plats to study the ratoon crops produced. Yields of seed cotton were secured which amounted to 301, 1,137, and 1,012 lbs. per acre, respectively. The highest yielding variety for both the first and second 1916 crops was Hartsville, with 1,820 and 1,754 lbs. of seed cotton per acre. Sea Island and Caravonica have proved unsatisfactory in all tests to date. Cotton growing throughout the island is briefly noted, and the following general conclusions drawn from accumulated data of cotton experiments: Cotton planting about May 1 is deemed unprofitable, as the ground is so occupied that the production of any other crop that year is prohibited, and because

the crop does not mature sufficiently early the next dry season to produce a ratoon crop that season. Cotton planted June 22 was completely harvested by 3.5 weeks before that planted December 7 following, the later crop maturing more uniformly and producing a higher quality ratoon crop. Cultivation during the rainy season proved impossible and weed control through the use of an arsenical spray difficult because of almost daily rains. The June planting required eight pickings, extending over 3.5 months, while the later planting required only three pickings, extending over but 3.5 weeks. Plantings made at the end of the dry season were of low grade and weak fiber as compared with the December plantings. The ratoon crop referred to required two seasons for its production.

Results obtained with Egyptian cotton in 1916 did not compare favorably with those secured in 1915, the difference being attributed to the date of planting and the source of the seed, the 1915 crop having been grown from Hawaii seed planted December 19, while the 1916 crop was grown from Arizona seed planted December 27—too late for seed from this source.

The native methods of rice growing are briefly described and fertilizer experiments with rice reported. The highest yield, 1,087 lbs. of rough rice per acre, was secured from an application of 95 lbs. of sulphate of potash. The untreated check yielded 259 lbs. With acid phosphate and nitrate of soda used alone the yield was 674 and 652 lbs. of rough rice per acre, respectively, while with a complete fertilizer it was 783 lbs. In variety tests, Hawaiian Gold Seed yielded 122 lbs., See Miu 704 lbs., and Porto Rico 105 lbs. The two native rices yielded 364 and 324 lbs., respectively. The imported varieties headed out about three weeks earlier than did the native rice. The native rice and Hawaiian Gold Seed lodged badly, while the other two varieties showed very little lodging.

Limited tests with alfalfa indicated that it is adapted to Guam conditions, although the results of an entire rainy season are deemed necessary for determination of its real value. Peruvian alfalfa has given the best results to date.

Tobacco investigations included variety and fertilizer tests and studies on the effects of shading and of lead arsenate treatment for the control of *Phthorimæa obsoleta*. The highest yield per plant from the unshaded plats was 12.14 oz. from White Burley with fertilization, and the lowest yield 3.5 oz. from Connecticut Broadleaf without fertilization. The average yield per plant for fertilized and unfertilized plats was: Oronoco 7.2 oz., White Burley 9.7 oz., Connecticut Broadleaf 5.8 oz., and Connecticut-Havana 5.2 oz. Shaded plats of White Burley and Oronoco gave an average yield of 48.6 per cent more tobacco per plant than unshaded plants on the same plats. An increased yield of 7.4 per cent was obtained with lead arsenate treatment. The unshaded plats gave an average increased yield of 21.88 per cent with fertilizers and the shaded plants an average increase of 10.1 per cent.

Soil inoculation tests with cowpeas gave yields of 885 and 868 lbs. of grain per acre, respectively, for inoculated and uninoculated fields, and 15,125 and 15,000 lbs., respectively, of green forage. Plantings of cowpeas on a lowland field yielded at the rate of 4.01 bu. of grain and 4,009 lbs. of green vines per acre. Other leguminous forage crops tested included soy beans, pigeon peas, lima beans, and velvet beans, the latter being deemed an especially valuable green and cover crop for Guam. In variety tests with velvet beans, the Florida variety appeared to be best for grain production, yielding at the rate of 14.3 bu. of grain and 7.3 tons of green forage per acre in 1916 from plantings made in June, 1915. Guam-grown Florida velvet beans yielded 11.4 bu. per acre as compared with a yield of 9.5 bu. from imported Florida seed.

Field tests with Kafir corn, feterita, and milo maize are reported, and the value of the first two as soiling or grain crops indicated. Yields of forage amounting to 22,700 lbs. of feterita and 12,501 lbs. of Kafir corn per acre were secured on lowland in 1915. Successive cuttings of feterita stubble yielded 19,199, 4,612, and 11,416 lbs. of stover or fodder for the second, third, and fourth cuttings, respectively, with grain yields of 10.8 and 9.8 bu. per acre for the third and fourth cuttings. Plantings of feterita, milo maize, and Kafir corn on relatively high but fairly fertile land on November 20 gave average yields of 11.4, 9.3, and 13.2 bu. per acre, respectively, while plantings made on the same field on December 10 gave average yields of 7.8, 6.8, and 9.1 bu. per acre, respectively. Seedings made January 10 on heavy lowland soil yielded 23.56 bu. with black-hulled Kafir corn, 18.18 bu. with feterita, and 15.7 bu. with dwarf milo maize, the yields of green stover amounting to 7,905, 8,028, and 5,628 lbs. per acre, respectively. Counts of suckers and side branches showed an average of 3 suckers and 2 side branches per plant for feterita, 1 sucker and 1 side branch for milo maize, and only occasional side branches or suckers for Kafir corn. Approximately 25 per cent of the feterita heads were in the flowering stage when harvested, while Kafir corn and milo maize were quite uniform in maturity and in height of plant.

In the renovation of Para grass fields the best results were secured from the use of barnyard manure, when six cuttings were obtained yielding 65,604 lbs. of green forage per acre. A mowing of Para grass was scattered in furrows about 3 ft. apart and covered with soil for comparison with the usual propagation method of setting out roots. The estimated cost of the planting, exclusive of plowing, was $3.60 per acre as compared with $10 per acre for the old method. The grass attained an average height of 3 ft. at the end of six weeks while approximately four months was required by the former system to attain sufficient growth for pasture. The new method is deemed especially desirable because it permits planting before the regular rains start, thereby providing pasture and a soiling crop during the rainy season.

The data from numerous tests with *Paspalum dilatatum* has led to the following general conclusions regarding the adaptability and planting of this grass: *P. dilatatum* on relatively high land has a value of fully one-half of that planted on low land during the rainy season. Large divisions of roots in plantings set not more than 2 ft. apart each way were found to be advisable even on low land for a thick turf and a quick pasture. Deep preparation of the soil before planting and careful weeding after planting are deemed essential for the best results. Live stock should not be pastured on the grass until four months after planting under ideal conditions, whereas on the higher lands full six months should be allowed for the grass to become established.

Field tests with Guinea grass (*Panicum maximum*), millet, *Elephantorrhiza elephantina*, and Russian sunflower are briefly noted, the last-named crop also being deemed sufficiently suited to Guam conditions for extended use.

[Report on field crops work at the Missouri Experiment Station] (*Missouri Sta. Bul. 147 (1917), pp. 35–37, 49, 50, 51, 52–54, figs. 4*).—This reports the continuation of work previously noted (E. S. R., 35, p. 825).

Corn investigations conducted by C. B. Hutchison, E. M. McDonald, and A. R. Evans included a continuation of variety tests at Columbia and on various fields throughout the State, the leading varieties remaining as previously reported (E. S. R., 36, p. 135), and cultural tests on the Maryville and Warrensburg fields. The highest corn yields at Maryville were secured for the first time from plantings made with a furrow opener, while single listing gave the next best yields, and surface planting the lowest yield. On the Warrensburg field little difference in yield was noted with corn planted on stalk land

sod both deep and shallow in the spring and that which had been plowed deep and shallow in the fall. Fall-plowed sod land gave slightly increased yields, while shallow fall plowing gave higher yields than deep fall plowing, and giving higher yields than spring plowing. Deep spring plowing gave 7.5 higher yields than shallow spring plowing.

Rate-of-planting tests and variety and breeding tests with wheat are reported. On the Shelbina field a seeding rate of 8 pk. per acre gave the highest yield, with the 7-pk. rate second, slightly decreased yields being recorded for the plats seeded at 5- and 6-pk. rates. The 10 leading wheat varieties at Columbia for the season of 1915 were Rudy, Lebanon, Harvest Queen, Fulcaster, Deltz, Pride of Genesee, Michigan Amber, Nigger, Pride of Indiana, and Gold Coin. In selection work the two best lines yielded 48.25 and 50.14 bu. per acre, respectively, while the original strains from which they were chosen yielded 41.45 bu. per acre.

Tests with winter oats were continued, some of the hardier strains giving promise for the future. An increased yield of 7.5 bu. per acre was obtained with oats sown on spring-plowed land as compared with the seedings on land disked and harrowed. Drilling in a seed bed prepared by disking and harrowing increased the yield over plats broadcasted and disked in by 8 bu. per acre. A seeding rate of 12 pk. per acre gave the best results. Variety tests with oats at Columbia gave an average yield of 44.3 bu. per acre for 24 varieties.

The improvement of winter barley varieties is reported as progressing favorably, while spring barley is deemed unsatisfactory at Columbia, due to the short growing season.

Cotton experiments, conducted by A. R. Evans, included variety and fertilizer tests. The five highest-yielding varieties are reported as Christopher Improved, Buck Long Staple, Hamilton Ounce Boll, Simpkin Prolific, and Other. The fertilizer tests included a comparison of applications of 200 lbs. of cottonseed meal, 200 lbs. of acid phosphate, and 3 tons of manure, resulting in increased yields of seed cotton of 470, 340, and 129 lbs. per acre, respectively, increases in no case deemed sufficient to pay the cost of the treatments.

E. M. McDonald conducted experiments on the influence of the spacing of rows of wheat and oats upon the yield and quality of grain. The 1915 oat crop was sown in rows, 3, 6, 8, and 12 in. apart, the 12-in. planting giving the highest yield, amounting to about 10 per cent more than the yield from the 6-in. planting. The 8- and 12-in. plantings of wheat were expected to yield from 10 to 25 per cent more than the 3- and 6-in. plantings in 1916.

This year completed the twenty-seventh year's work on crop rotation experiments conducted by M. F. Miller and R. R. Hudelson. The unmanured corn plat yielded 38 bu. per acre as compared with a yield of 45.7 bu. for the manured plat. The average yield for the untreated plat for the last six years was 11.14 bu. and for the treated plat 28.52 bu. per acre. The relatively high yield of the last year is attributed to the effect of sufficient rainfall. A complete fertilizer of 3 per cent nitrogen, 10 per cent phosphorus, and 4 per cent potash gave the highest yield of wheat for all treatments.

Experiments on the associated growth of corn and cowpeas resulted in heavier yields of corn grown without cowpeas than when grown with them in the row or between the rows. A slight decrease in the nitrogen content of the corn and stover was noted where cowpeas were grown in the row. Determinations of the nitrates in the soil showed that cowpeas grown alone exhausted the supply of available nitrates as much as corn, indicating that the cowpeas secured no nitrogen from the cowpeas. A pronounced physiological effect

of the association of these two crops was observed in the green appearance of the corn foliage late in the season where cowpeas were grown either in the row or between the rows, but has not yet been explained.

Experiments to determine the effect of handling cowpea land in various ways on the wheat crop following indicated that land into which the cowpeas have been worked gave better wheat yields than land receiving no cowpeas or land from which cowpeas have been cut. Little evidence has been secured to show any deleterious effect of cowpeas on the following wheat crop.

A study of the factors influencing the development of the maize plant by M. F. Miller and F. L. Duley, again demonstrated that the middle third of the growing period (from time of laying-by to time of silking) was the most critical from the standpoint of both moisture and nutrient supplies. The water requirement of the plant was found not to be greatly influenced by the variations in the supply during the growing period, but to vary greatly with different seasons. The optimum water supply during 1915 gave a weight of ears equal to 36.9 per cent of the total weight of the plant, while the minimum moisture supply gave an ear weight of 17.9 per cent of the total. An optimum supply of plant food gave grain representing 35.8 per cent of the total, while a minimum supply gave a grain weight of only 1.9 per cent of the total.

[Field crops], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1915–16, pp. 5–7, 8–11, 13–15*).—Brief notes are given on the results of cotton selections based on the mean maximum length of fiber, percentage of available fiber, average weight of seed, and percentage of lint to seed. Further cotton investigations included studies with crinkled dwarf rogues, inheritance of the number of teeth in the bracts of cotton, resistance to leaf blister mite (*Eriophyes gossypii*) in budded cottons and in cotton hybrids, Brazilian cotton, and fertilizer tests with Sea Island cotton.

Attempts to improve the native corn varieties through selection are reported along two lines, first, to produce uniform yellow corn, and second, to increase the size of grain and amount of grain per ear.

The twenty-sixth year of crop experiments, B. R. Larsen, A. Herstad, H. Foss, and K. Vik (*Aarsber. Norges Landbr. Höiskoles Akerbrukforsøk, (1914–15), pp. 3–65, figs. 5*).—The extension of cooperative field crop tests in 1914 is discussed, and the results of several experiments are reported.

In experiments conducted for five years, potatoes planted about May 15 gave on the average a higher yield of tubers and a greater percentage of total production of dry matter than potatoes planted earlier or later. Plantings made about May 7, however, produced the largest tubers. Variations in yearly results were brought about by weather conditions. The late and medium late varieties proved better adapted to early planting than early or medium early sorts. It was found that under the prevailing conditions there was no advantage in planting potatoes, especially medium early varieties, before the soil at 25 cm. (10 in.) under the surface had reached a temperature of from 7 to 8° C. (44.6 to 46.4° F.). The date of planting seemed to have had no influence on the prevalence of dry rot.

Experiments on the influence of subsoiling to the depth of about 16 in. on soil consisting of a mixture of clay, sand, and gravel, and of a good moisture-holding capacity, with a subsoil of a clayey character but not very hard, were conducted for six years. The crops grown were turnips, potatoes, peas, spring wheat, and oats. The average results with all these crops showed an increase in yield from subsoiling, the largest increase in value being obtained with peas. The average results further indicated that the work had been done at a profit.

The results secured in an eight-year test of level and ridge culture of root crops indicated that the germination of the seed and the early growth of the

especially during dry weather, is best with level culture, and that on well worked and under favorable moisture conditions the differences under these methods of culture are comparatively small.

... with leguminous green forage crops on poor soils showed the ... rolling field peas, vetches, and other leguminous plants to mixtures of ... crops for the purpose of increasing the yield of green forage and of ... improving their quality.

... culture experiments at the Norwegian Agricultural High School, ... S. HASUND and P. BOMFORD (*Ber. Norges. Landbr. Høiskoles Jordskifte, 1914-15, pp. 1-22, 81-54*).—The extension of cooperative field crop ... in 1915 is pointed out, and the results of a number of these experiments reported.

Average results of 81 cooperative fertilizer tests with nitrate of soda ... sulphate of ammonia showed that the unit of nitrogen in sulphate of ... represented from 80 to 90 per cent of the value of the unit in nitrate. In other cooperative tests the action of lime was found quite marked ... year on soil either unfertilized or fertilized with barnyard manure. ... soil receiving commercial fertilizers the effect of lime was unim... the first year but much more striking the second and third years. ... operative series of 67 tests with lime, potatoes were not found bene... its use, while meadows, as shown by 4-year experiments, gave an in... of 5.6 per cent in the yield of hay and barley fields of 4.4 per cent in the ... grain as apparently due to lime treatment. A larger increase from ... was secured with unfertilized than with fertilized crops of barley.

... native subsoiling tests in connection with the culture of different crops ... ted results and did not allow drawing general conclusions.

Experiments with field crops, A. SJÖSTRÖM (*Rev. Uppsala Landthr. Inst. ..., 1915, pp. 41-52*).—The results of cultural and variety tests with ... and root crops are briefly reported. Petkus rye sown at three different ... gave practically the same yields of grain and straw from the three differ... dates. The differences in yield resulting from sowing Hannchen barley ... first, fifth, and twentieth of May, as well as from pulverizing the soil ... of 3, 5, and 7 cm. (1.2, 2, and 2.8 in.), were also insignificant.

... of soiling crop mixtures the best yield in the green forage cut July ... matter and nitrogen, 4.6 tons and 82 kg. per hectare (4.1 tons and ... per acre) respectively, was secured from a seed mixture consisting of ... oats, 175 kg. of field peas, and 40 kg. of vetch per hectare. Analyses ... part of the crop allowed to ripen and harvested September 8 showed ... dry-matter content had almost doubled since July 22.

... experiment Petkus rye harvested and analyzed at weekly intervals ... June 1 to July 7 continued to increase in the yield of green forage until ... 22. The dry-matter production continued to increase and at the close of ... was found to be four times as great as at the beginning, the average ... increase being 940 kg. per hectare. The ... and nitrogen content continued to increase up to June 22.

... of a seed mixture consisting of 110 kg. of oats and 160 kg. of vetch ... and harvested weekly from July 7 to August 17 showed a continued ... in dry-matter during the period, with the exception of the last two ... when this factor remained constant. The percentage of vetch in the ... of the crop mixture increased from 25 to 50.1 per cent during the ex... ...

Turnips, swedes, and field beets grown in comparison produced 85.8, 70.2, ... tons of roots per hectare, respectively. The average weight per root ... 1.17 kg. for the turnips, 1 kg. for the swedes, and 0.69 kg. for the field

beets. The percentage of dry matter was highest in the field beets and lowest in the turnips. On October 13 the yields of dry matter per hectare were 8.5, 7.60, and 8.24 tons, and on November 10, 7.93, 8.28, and 8.18 tons for the turnips, swedes, and field beets, respectively. During the period of maximum growth, or from the middle of August to the middle of September, the crops produced over a ton of dry matter per hectare per week. Immediately after this period the production of dry matter fell to 0.5 ton, and a little later to 0.3 ton per hectare per week, while after October 13 no further production of dry matter was perceptible. Analyses of the forage made at various intervals from August 4 to October 13 indicated that the more rapid formation of dry matter took place in the first half of September, while the greater percentage of water was found prior to September 1.

The results of planting these root crops at different distances were in favor of planting in rows 60 cm. apart with the plants 25 cm. apart in the row, or 1,500 sq. cm. (132 sq. in.) of space per plant. These results were influenced to a certain extent by a poorer stand on the closer planted plats.

In a variety test Ostersundom turnip outyielded Bortfeld and Yellow Tankard and Red Eckendorf field beets produced a higher yield than Barres Halfloss. Satisfactory yields of a variety of swedes and of sugar beets are reported.

[Field crops], B. C. Burt (*Rpt. Cawnpore [India] Agr. Sta., 1916, pp. 2–8*).—This reports work at the Cawnpore experiment station (E. S. R., 31, p. 732) for the year ended June 30, 1916.

Notes are given on fertilizer experiments with wheat, and green manure tests and cultural experiments with wheat, cotton, gram, sugar cane, millet, pigeon peas, tobacco, barley, flax, and peanuts. Other experiments reported include deep v. shallow sowing for maize, maize and peanuts as a mixed crop, tests of different spacings with American cotton, rotation tests, and fodder crop experiments.

[Field crops], A. C. MacDonald (*Dept. Agr. Brit. East Africa Ann. Rpt. 1913–14, pp. 191, pl. 1; 1914–15, pp. 145*).—These reports continue work previously noted (E. S. R., 26, p. 793). Brief notes are given on the production of sisal, cotton, flax, corn, wheat, tobacco, and certain tropical plants in British East Africa, with supplementary reports from the government experimental farms at Kibos, Nairobi, and Kabete.

The advancement of the agricultural industries and of stock breeding in the Protectorate is summarized for the past seven years.

Cultural experiments conducted in Denmark with different mixtures of the seeds of forage plants, E. Lindhard (*Tidsskr. Planteavl, 22 (1915), No. 4, pp. 553–718, figs. 2; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 2, pp. 224, 225*).—The author discusses the results obtained in a series of experiments with mixtures of seed of forage plants covering a period of twelve years, 1900 to 1912. The data are presented in tabular form. A mixture recommended by Nielsen and composed of the following ingredients per acre was used as a basis for comparison: Early red clover 6.4 lbs., *Trifolium hybridum* 1.8 lbs., *T. repens* 0.3 lb., *Agropyron repens* 3.2 lbs., *Avena fatua* 3.2 lbs., *Phleum pratense* 1.8 lbs., *Festuca pratensis* 1.1 lbs., *Lolium perenne* 1.8 lbs., and *L. italicum* 1.6 lbs.

A summary is given of the results obtained with ten other Gramineæ Leguminosæ combinations. These together corresponded to the most varied cultural conditions, and, when used according to their individual adaptations, gave much better results than the Nielsen mixture.

Pollination and fertilization studies with grasses and legumes at the Tystofte Experiment Station, H. N. Frandsen (*Tidsskr. Planteavl, 23 (1916), No. 3, pp. 442–486, figs. 6*).—The studies described were conducted with orchard

grass, tall oat grass, meadow fescue, English rye grass, Italian rye grass, timothy, meadow foxtail, *Poa fertilis*, field brome grass (*Bromus arvensis*), red clover, bird-foot clover, alfalfa, and yellow trefoil. In addition to the data secured the results obtained by other investigators are briefly reported.

Pollination experiments conducted with orchard grass for several years showed that the species, while generally cross-pollinated, produced seed to a large extent under self-fertilization. It was found that individual plants show considerable variation with reference to self-fertility. Similar experiments, but on a smaller scale, showed that tall oat grass under ordinary conditions is predominantly cross-pollinated. Pollination experiments with meadow fescue gave results very much the same as those secured with orchard grass. The two species of rye grass proved chasmogamous. In a series of pollination studies with timothy the plants behaved much like those of the foregoing species, but the results also indicated that types comparatively high in fertility when close-pollinated may be isolated.

Meadow foxtail proved to be generally cross-pollinated and did not seem to be lower in fertility when isolated than the species above mentioned. *P. fertilis* under ordinary conditions was found to be cross-pollinated, but when isolated close-pollination resulted in complete fertilization, and under unfavorable weather conditions during blossoming self-fertilization also took place. While field brome grass gave complete fertilization with pollen from the same plant, cross-pollination predominated when the weather conditions were favorable.

The results with red clover indicated the practically complete self-sterility of the plant. With reference to bird-foot clover it was concluded that cross-pollination is necessary for seed production and that pollination is dependent upon the action of insects.

In the case of alfalfa natural self-pollination produced some seed but artificial self-fertilization was much more effective in this regard, while artificial cross-pollination resulted in twice the number of seeds secured from artificially self-pollinated plants. The author discusses the possible relation of climate as a factor in this connection in addition to insects as pollinating agents.

Yellow trefoil showed a certain degree of self-fertility. In all the experiments conducted with this plant the blossoms of isolated individuals opened cleistogamically.

Experiments with bird-foot clover and alfalfa in grass mixtures. E. Lindhagen (*Tidsskr. Planteavl, 23 (1916), No. 4, pp. 605-622, figs. 2*).—The experiments described were conducted at Tystofte from 1910 to 1913. The mixtures used per töndeland (1.36 acres) in one series consisted of 8, 12, or 16 lbs. of bird-foot clover and varying quantities of orchard grass, tall oat grass, timothy, and *Poa fertilis*, the smaller quantities of grass seed being used with the larger quantities of bird-foot clover seed and vice versa. Where bird-foot clover was sown alone it was used at the rate of 20 lbs. per töndeland. The average yields of hay per töndeland for the three different quantities of seed for each mixture were as follows: Orchard grass 110, tall oat grass 140, timothy 120, *P. fertilis* 121, and bird-foot clover alone 125 cwt. The quantity of bird-foot clover in the hay of the different mixtures and the pure seeding was 36, 30, 43, 55, and 78 per cent, respectively.

In a second series of experiments 12 or 20 lbs. of alfalfa seed per töndeland was sown in a mixture of the different quantities of the grasses mentioned above. For the pure seeding of alfalfa 30 lbs. of seed per töndeland was used. The average yields of hay for the unit area for the two different quantities of seed for each mixture were as follows: Orchard grass 156, tall oat grass 178, timothy 171, *P. fertilis* 161, and the pure seeding of alfalfa 159 cwt. The proportion of alfalfa in the hay from these different seedings was 50, 47, 57, 74,

and 89 per cent, respectively. The detailed results of the experiments are given in tables.

On the germinability of rice (Oryza sativa) and corn (Zea mays) in relation to temperature and humidity. ANNA DA FANO (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 16 (1916), pp. 17–39*).—This paper reports experiments with two varieties of rice and three varieties of corn in a study of the effect upon germination of varying the temperature, the loss of moisture in the seed during exposure to the various temperatures, and the percentage of moisture in the seed during germination. The plan of the experiment included the exposure of the seed of the different varieties for from one to three hours, at temperatures of 20, 30, 50, 60, 70, and 80° C., and for one hour at a temperature of 90°. The seeds were also germinated at the temperature of the surrounding air, approximately 23°. The data are presented in tabular form and discussed at some length.

The author concludes that in *O. sativa* the maximum germination was obtained after exposure of the seed for three hours at 30°, except with the Ranghino variety, which attained its maximum germination after two hours exposure at 40°, and the germination of the different varieties varying between 84 and 88 per cent. The minimum germination observed occurred with exposure for three hours at 80°, and varied between 18 and 24 per cent, while exposure for one hour at 90° entirely destroyed the power of germination. The maximum moisture content of the seed for successful germination did not correspond in any way to the maximum moisture content of the seed. The quantity of moisture best suited for germination in *O. sativa* apparently lies between the limits of 9.5 and 12.5 per cent, figures which correspond to the moisture content present at the maximum and minimum germination of the seed.

The results obtained with *Z. mays* were analogous to those noted above. Maximum germination was observed after exposure of the seed for two hours at 40°, varying between 93 and 95 per cent. The minimum germination occurred after exposure for three hours at 70°, while exposure for one hour longer at 80° resulted in loss of germinability. As in *O. sativa* maximum and minimum germination did not correspond to maximum and minimum moisture content of the seed, but to an intermediate value.

Wheat and rye production in Iowa. W. R. HECHLER (*Iowa Sta. Circ., 67 (1917), pp. 8, figs. 3*).—Recommendations are made for increased production of winter and spring wheat and winter rye in Iowa.

Plants growing on moor soils as a source of fiber, and the use of sphagnum in making bandages. H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 31 (1917), No. 1, pp. 96–109, pls. 2, figs. 4*).—This article discusses the value of *Eriophorum vaginatum* as a source of fiber for use in the textile industries and reviews briefly experimental and commercial work in this direction. The results of an experiment on the capacity for water absorption of air dry fiber samples of *E. vaginatum*, flax, jute, cotton, and wool are reported. Brief notes are also given on the use of sphagnum moss in the preparation of bandages.

The origin and cultural history of the Danish strains of Barres field beet. L. HELWEG (*Tidsskr. Planteavl., 23 (1916), No. 2, pp. 289–339, figs. 20*).—An article discussing briefly the origin of the field beet and its development from the wild species *Beta maritima*. The early cultivated forms are briefly noted and the more important varieties grown in Denmark at the present time are described.

In reviewing the history of the Barres field beet in Denmark it is pointed out that this variety constituted 21.2 per cent of the field beets grown in 1884 as compared with 88.4 per cent in 1915. The area devoted to the variety in 1915 was approximately 270,000 acres. The history of different strains of

...gold beet now recognized in Denmark is briefly traced, and five strains, ... Nissgaard, Sludstrup, Rosted, Ferritsley, and Lille Taarøje, are described in detail with reference to form, color, top, ease of lifting, yield, dry ... content, and uniformity.

...tical studies of variegated pericarp in maize, R. A. EMERSON (*Genetics, ... No. 1, pp. 1-35, figs. 4*).—This paper continues the study (E. S. R., ... 31, p. 135) of the inheritance of self-pattern in the pericarp of ..., occurring as a sporophytic variation in variegated ears.

...ter studies are in entire accord with those previously reported. The ... formerly termed these changes somatic variations because they were ...nifested in somatic cells. It was apparent from the beginning, however, ... the factorial modification responsible for the visible change must often ... meristematic cells from which later arise the germ cells as well as ...matic tissues of the pericarp, or even of the whole ear, and since such ...somatic cells are germinal rather than somatic the variation is deemed to ...ter termed sporophytic.

...ect variations in variegated ears of maize are described and new phases ... problem reported on. Most of the data presented were obtained in ...on with heredity studies conducted at the Nebraska Experiment Station. ...s studied were inheritance of sporophytic mutations from variegation ...or, changes in type of variegation, reverse mutation self-color to ..., suggested explanation of the inheritance of certain sporophytic ... and the noninheritance of others, and the relation of variegation to ...r constancy.

...ed ears used in the later studies have all been pollinated by colorless ... to avoid difficulties arising from the uncertainty of the purity of the ... of variegated races. Self-colored, partly self-colored, variously varie... colorless seeds from variegated parent ears, thus pollinated, have ... progenies containing a percentage of self-colored ears roughly propor... the amount of self-color in the seeds planted, the maximum being ...ately 50 per cent from self-colored and near-self seeds and the mini... from colorless seeds. This has been equally true whether the parent ...ve been homozygous or heterozygous for pericarp color. In the latter ... self-colored ears have always occurred at the expense of variegated ...or at the expense of colorless ones. Medium variegation has been ... to be a simple Mendelian dominant to very light variegation. Self... ears appearing in the progeny of F_1 ears of this cross have occurred at ...ense of medium variegated ears rather than in the place of very light ...ed ones. These facts are held to indicate that a genetical factor for ...ation mutates to a factor for self-color, that only one of the duplex ... ordinarily so mutates, and that the factor for medium variegation ... much more frequently than that for very light variegation."

...results obtained indicate that there is an inheritance of a light type of ...tion arising as a sporophytic variation on medium variegated ears, ...gh this has not been fully investigated. A sporophytic change in the ... variegation resulting in seeds with strongly colored crown spots asso... with self-colored cob glumes is not inherited as regards either pericarp ... color.

...one to five wholly or partly variegated seeds per ear have occurred on ...thirds of the self-colored ears descended from two presumably unre... variegated ears. Other related and unrelated cultures have not exhibited ...optional seeds, and no variegated seeds, as far as known, ever occurred ...homozygous self-colored ear. One test indicates the inheritance of these ...ably reverse mutations from self-color to variegation.

Histological examinations of the developing ovary and glumes and of the mature seed suggest a possible explanation for the color peculiarities of the distinct somatic variations and for the inheritance of some and the noninheritance of others. The change from variegated to near-self seeds associated with the change in the color of the glumes is thought to occur only in subepidermal cells and consequently may be inherited, while the change from variegated to self-colored seeds accompanied by self-colored glumes is thought to be limited to the epidermal layers and hence incapable of inheritance.

These results are thought to favor the idea that single allelomorphic factors rather than two or more closely linked factors, are responsible for the color pattern of both glumes and pericarp.

"The phenomena studied are held to have an important bearing on the question of unit-factor constancy. The existence of the series of at least nine or ten multiple allelomorphs to which variegation belongs indicates that a factor for pericarp color has mutated several times. Some of the factors of the series have not been observed to mutate, while others have mutated rarely, and still others many times. In fact, the principal difference between certain of the factors is thought to lie in their relative frequencies of mutation. It is suggested that data such as is here presented may help to explain the somewhat diverse results of selection experiments within pure lines, clonal lines, and the like."

Contribution to the study of cotton production and its future. J. V. Natta Maglione (*Bol. Min. Agr. [Argentina], 20 (1916), No. 7–8, pp. 631–646, figs. 8*).—This is a general discussion of cotton production in Argentina. The cost of production is estimated and presented in tabular form.

Studies on oat breeding.—V. The F_1 and F_2 generations on a cross between a naked and a hulled oat. J. Zinn and F. M. Surface (*U. S. Dept. Agr., Bur. Agr. Research, 10 (1917), No. 6, pp. 293–312, pls. 9*).—In continuing work at the Maine Experiment Station previously noted (E. S. R., 35, p. 831; 36, p. 834) the authors describe in detail a white naked oat, *Avena sativa nuda* var. *mis*, and a black-hulled oat, *A. sativa patula* var. Victor, and the F_1 and F_2 generations of a cross between the two. The Victor oat was the female parent and the naked oat the male parent, the F_1 progeny consisting of 11 hybrid grains, only 4 of which germinated when planted in 1915. The F_2 generation comprised 854 plants, all of which, together with the F_1 generation, were examined for hull character, grain color, pubescence at the base of the grain, and inheritance of awns.

The hulled parent was characterized by the presence of firm flowering glumes which adhered closely to the caryopsis, bifloreous spikelets, black color of glumes, strong awns, and a long but rather sparse pubescence at the sides of the base of the lower grain. The naked parent was characterized by loose membranous flowering glumes which did not adhere to the caryopsis, bifloreous spikelets, white or light yellow glume color, almost total absence of awns, and the absence of pubescence. It is suggested that the absence of awns and of pubescence may be due to the inability of these characters to express themselves on the thin membranous glumes.

The F_1 generation is described as distinctly intermediate in most characters. In regard to the glumes, both naked and firmly-hulled grain and intermediate forms were found on the same panicle and even in the same spikelet. The spikelets near the top of the panicle were entirely naked, or nearly so, while those near the base of the panicle tended to be firmly hulled. A similar but less marked relation was observed between the spikelets near the tip and base of each whorl.

... number of intermediate forms appeared in the F_2 generation in addition to the two parental hulled types, four definite groups being distinguished. The intermediates contained all gradations from plants with perfectly hulled grain to the perfectly naked forms. The inheritance of the hulled characters appeared to be a simple Mendelian ratio, giving 1 hulled, 2 intermediate, 1 naked. In the case of color also there were three black plants to one white. It is shown that the genes for these two characters segregate independently of each other. Triflorous spikelets occurred only in connection with naked grain, plants with completely hulled grain bearing only biflorous spikelets.

The inheritance of pubescence at the base of the lower grain presented some difficulties, since it could not be manifested on plants with naked grain. By the use of a selected group of plants having hulled and intermediate grain, however, it was found that pubescence behaves as a bifactorial character, giving 15 pubescent plants to 1 without pubescence. Neither of these genes were linked with those for color. Available evidence indicates that one of these pubescent genes may come from the naked parent. Long and short pubescence at the base of the grain behaved as a monohybrid character and segregated independently of the other genes considered.

A remarkable feature of this cross was observed in the presence of pubescence at the base of the upper or second grain, no cultivated varieties of oats possessing this character. In this cross these forms occurred only on spikelets where the lower grain was naked or seminaked, and it is deemed probable that the presence of this pubescence was due to physiological disturbances caused by the presence of the naked lower grain.

The presence of awns was also affected by the nature of the glumes, a naked grain bearing only thin, weak awns. Considering only the hulled and intermediate types of grain, there appeared to be a simple 3:1 ratio between plants having medium strong to strong awns and those with weak awns.

[Potato culture], P. WEBER and KLEBERGER (*Jour. Landw., 64 (1916), No. 3, pp. 181–199*).—The authors report experiments conducted on sandy, loamy, and clay soils to test the effect of complete mineral fertilization, with especial reference to the nitrogen carrier, on the yield of potatoes and starch for each soil type. The nitrogenous fertilizers consisted of ammonium sulphate, calcium nitrate, ammonium nitrate, and liquid manure. The treatment of the plats was identical, and consisted of 352 lbs. of Thomas slag, 176 lbs. of 40 per cent potash salt, and either 176 lbs. of ammonium sulphate, 176 lbs. of calcium nitrate, 88 lbs. of ammonium nitrate, or 1,280 liters of liquid manure per acre. The soil type for each series of plats is described and the fertilizer treatment for each plat, together with the results obtained, are given in tabular form.

The results of the experiments indicate that nitrogen fertilization affects the yield of potatoes on the better loam and clay soils, while upon the sandy soils the potash and phosphorus fertilizers appeared to have the most pronounced effects. Satisfactory yields were not obtained on the heavier soils, however, with nitrogen alone. Of the nitrogen carriers tested, ammonium sulphate gave the best results on all soil types, although liquid manure gave very good results and is to be especially recommended at the present time.

The highest starch yields were obtained from the use of potash and phosphorus alone, liquid manure producing a slight and the remaining nitrogenous materials a decided reduction in the starch content.

The utilization of the nitrogen in the fertilizers did not always parallel the yields obtained. This was noticeable in the case of ammonium sulphate on clay soil, where only 90 per cent of the nitrogen was used, indicating that the nitrogen from the ammonium nitrate must have been used for the formation of

vegetative parts, such as the stem and leaves. The utilization of the potash and phosphorous fertilizers was materially influenced by the nature of the nitrogen carrier, the most complete utilization being obtained in connection with ammonium sulphate. The effect of liquid manure in this respect is favorable on loam soils.

The irrigation of potatoes. F. S. HARRIS (*Utah Sta. Bul. 157 (1917), pp. 3, figs. 9*).—Rather extensive irrigation experiments with potatoes conducted at the Greenville Experiment Farm are reported for the 5-year period of 1912 to 1916, inclusive. The life of the potato plant was divided into four stages (1) when the vines were 4 in. high, (2) when the tubers began to form, (3) when the potatoes were in full bloom, and (4) when the potatoes were nearly ripe. One, 2½, 5, and 7½ in. applications of irrigation water were made weekly and 5-in. applications at the different stages of growth. Important literature on the subject is reviewed and detailed tabular data presented.

A comparison of the yields of tubers and vines on plats receiving different quantities of irrigation water weekly showed the highest average yield of tubers for the 5 years, 337.1 bu., to have been obtained from a total of 12.8 in. applied 1 in. per week during the growing season. The maximum application of 96 in., or 7½ in. weekly, resulted in a lower average yield of tubers, 140.7 bu., than where no irrigation water was given, 153.3 bu., although the weight of air-dry vines was nearly doubled.

In a comparison of single applications at different stages of growth the lowest yield of tubers, 139 bu. per acre, resulted from an application made after planting and before the vines were up. The best results were secured from applications made when the plants were in full bloom and averaged 229 bu. per acre. Neither 10, 15, nor 20 in. applied in two, three, or four irrigations of 5 in. each gave results equal to regular weekly applications of 1 in. each. Late applications, as well as large quantities, of water increased the rank growth of the vines.

The average size of the tubers was larger where the water was applied weekly with 1-in. applications, both 5 and 7½ in. weekly applications producing smaller tubers than where no irrigation water was used. The tubers on plats receiving water at the third and fourth stage and those receiving it at all four stages averaged the same size and were larger than for any other treatment.

The average number of tubers per hill was largest with a 2½-in. application per week, while early applications appeared to be conducive to a large production of tubers per hill.

The average weight of the hills, determined by weighing 100 average hills from each plat, was highest with 1 in. and 2½ in. weekly irrigations, while a rapid decrease in weight per hill was noted with an increase in the amount of water applied. Applications made in the third stage proved most effective in increasing the weight per hill.

All irrigation treatments produced vines that were higher than those produced with no irrigation, but a comparison of the vine growth is deemed not sufficient as an indication of the relative value of the different irrigation treatments. A wide variation in the color of the vines was noted for the different methods of irrigation and was considered a reliable means of determining the moisture requirements of potato plants.

The experiments are held to indicate the importance of an even supply of moisture during the middle portion of the life of the potato, after the tubers begin to form and before they begin to ripen.

Shallu, or "Egyptian wheat," a late-maturing variety of sorghum. B. F. ROTHGEB (*U. S. Dept. Agr., Farmers' Bul. 827 (1917), pp. 8, figs. 3*).—Shallu is

described as a late-maturing variety of sorghum exploited as Egyptian wheat, Texican Desert wheat corn, and under many other local names.

The results obtained with shallu when grown under the dry-land conditions of the southern Great Plains are cited and compared with those secured from the grain sorghum varieties such as Dwarf milo maize, Dwarf Kafir corn, and Feterita in variety tests in Texas, Oklahoma, Kansas, and New Mexico.

Owing to its late maturity (125 to 140 days) shallu is subject to injury by drought and even under the most favorable dry-land conditions the yields are lower than those of Kafir corn and milo maize, while in unfavorable seasons it frequently fails entirely. Shallu often lodges badly and is not to be recommended where milo maize or Kafir corn can be grown successfully.

The irrigation of sugar beets. F. S. HARRIS (*Utah Sta. Bul. 156 (1917), pp. 3–24, figs. 14*).—Experiments with sugar beets are reported, showing the effect of different weekly irrigations and of standard 5-in. irrigations applied at certain periods in the growth of the plant on the yield of roots, yield of sugar, percentage of sugar and purity, and size and shape of beets. The life of the sugar beet plant was divided into the following stages: (1) Just before thinning, (2) four weeks after thinning, (3) when the beets averaged 2 in. in diameter, and (4) when the beets were nearly ripe. The weekly irrigations consisted of applications of 1, 2.5, 5, and 7.5 in. of water, made during the regular irrigation season. Tabulated data are presented for the 5-year period 1912–1916, inclusive, and the results compared graphically.

The highest average yield of beets on plats receiving weekly irrigations was secured from 1-in. applications, and amounted to 21.92 tons per acre, as compared with a yield of 12.98 tons without irrigation. When but one irrigation was given, that applied at the third stage of growth gave the highest average yield, 18.92 tons per acre. Where more than one application was made the highest average yield, 23.39 tons per acre, was secured from irrigations made in the first, third, and fourth stages of growth. Irrigation after planting but before the plants were up gave a yield of only 11.22 tons per acre. After the plants were up the least desirable time for irrigation was during the fourth stage of growth, when an average yield of but 15.09 tons was secured. Proportionately more tops were produced by the high and late irrigations than by opposite conditions.

Except where the water was applied quite late, the percentage of sugar and of purity was higher in the irrigated beets than in the nonirrigated. The highest average percentage of sugar was secured from a weekly application of 2.5 in. of water and amounted to 16.32 per cent. When one irrigation was given, the highest average percentage, 15.73 per cent, was obtained from an application made in the third stage of growth, while an average of 14.5 per cent was obtained from plats receiving no irrigation. The highest average purity was secured from weekly applications of 5 in. of water and amounted to 83.9 per cent, as compared with 78.4 per cent from nonirrigated plats and 83.2 per cent from 2.5 in. of water weekly.

The length of beets was not increased by delaying the time of application of the first irrigation, early irrigation apparently facilitating penetration of the roots into the soil. The average length of root from the nonirrigated plats was 9.06 in., while the longest roots were secured from the plats receiving applications of water during the first three stages of growth, and averaged 11.7 in. Weekly applications of 1 in. of water gave roots with an average length of 11.5 in.

Irrigation affected the size of the beets in about the same manner that it affected total yield. The highest average weight, 2 lbs., was secured from plats receiving 1 in. of water weekly, as compared with an average weight of 1.09 lbs.

from the nonirrigated plats. The percentage of forked beets bore no appreciable relation to the amount of water used.

The author concludes that sugar beets do not require large quantities of irrigation water, provided it is properly applied, but that they are sensitive to the time of application.

The weeding of wheat, E. Rey (*Jour. Agr. Prat., n. ser., 29 (1916), Nos. 1, pp. 324–326; 20, pp. 346–348; 23, pp. 392–394; 25, pp. 429, 430*).—This is a general discussion of the beneficial effects obtained from weeding wheat. The author cites a number of authorities in support of his arguments, giving the results of several experiments and emphasizing the economic phases.

The effect of heating seeds upon the development of the plant; experiments made in Russia with wheat, S. J. Worobiew (*Khozyaistvo, 10 (1915), No. 47–48, pp. 1075–1083; abs. in Internat. Inst. Agr. [Rome], Internat. Rev. Sci. and Pract. Agr., 7 (1916), No. 4, pp. 527–539*).—The author reports experiments with "Arnautka" (a mixture of different varieties) and Kubanka wheats, strains of *Triticum durum*, to determine the effect of relatively high temperatures upon the plant embryo. The seeds were planted in pots after exposure for 20 minutes to a temperature of 80° C. (176° F.). The pots received 60 and 20 per cent of the amount of water required to saturate the soil. The results obtained are summarized in an appended table.

The author concludes that heating has a stimulating effect upon the embryo and promotes a tendency to xerophytic structure, shown in the reduced height of the plant, the decreased relative weight of the leaves, and the dimensions of the cells. Since xerophilous plants best withstand a lack of water, it can be assumed that where moisture is abundant, heating the seed produces no modification in the structure of the plant, but where it is limited, heated seeds produce plants so modified as to withstand drought.

Root-crop seeds.—Harvest and trade of 1915–16, L. Helweg (*Tidsskr. Planteavl, 23 (1916), No. 3, pp. 487–518, fig. 2*).—An article discussing at some length the yield and quality of turnip, field beet, rutabaga, and carrot seed secured in Denmark in 1915, including a review of a number of court decisions in settlement of cases arising in the root-crop seed trade.

Yellow rocket, a dangerous weed, E. A. Bessey (*Michigan Sta. Spec. Bul. 80 (1917), pp. 8, fig. 4*).—Yellow rocket, winter cress, or herb barbara (*Barbarea barbarea*), said to have been introduced as an impurity in clover and grass seeds, is briefly described and methods of eradication recommended.

HORTICULTURE.

One thousand hints on vegetable gardening, Mae S. Croy (*New York and London: G. P. Putnam's Sons, 1917, pp. VII+275*).—This work comprises practical hints arranged in short paragraphs on the culture of the common vegetables, fruits, and nuts, together with miscellaneous suggestions relating to gardening and garden equipment, planting tables, etc.

[Report of horticultural investigations], A. C. Hartenbower (*Guam Sta. Rpt. 1916, pp. 26–38, pls. 2*).—Notes are given on the acquisition and distribution of seeds and plants during the year, together with data on general fertilizer and cultural tests of beans, peppers, eggplants, radishes, carrots, muskmelons, cucumbers, watermelons, squash, okra, pumpkins, sweet corn, onions, and udo.

A test was started on August 1, 1915, to determine the longevity of vegetable seeds when stored in ground-glass top exhibition jars and when stored in cloth sacks in insect-proof wooden cabinet drawers. Germination tests were made at semimonthly intervals until the following June 15. The data as here pre-

...ed in tabular form show a marked advantage in using closed jars as the ... storage increases.

... notes are given on the condition of fruit trees introduced at the station ... to July 1, 1914, and during 1915 and 1916. Tests of the inarching ... of propagating mangoes resulted in a loss of 18 per cent of the plants. ... size of fruit in the station lowland pineapple field was materially increased ... providing good drainage. The station is to undertake work looking to the ... movement of the coconut crop on the island.

Progress report on horticultural investigations] (*Missouri Sta. Bul. 147 ... pp. 10–13, 44–47*).—In continuation of previous reports (E. S. R., 35, p. ...) concise statements are given of progress made along various lines of horticultural work during the year ended June 30, 1916.

... nutrition studies in charge of J. C. Whitten and C. C. Wiggans were ... with strawberries, peaches, and apples during the year. The work ... strawberries was confined to the use of fertilizers containing phosphorus, ... previous results from the use of potassium and nitrogen were negative. ... phosphate applied directly to the row, either the current year or the pre... year, caused a marked increase in yield, while bone meal even at the end ... second year caused no increase. The question has been raised as to ... or not the effect of the acid phosphate may not be wholly or in part ... to the acid condition possibly resulting from its application rather than to ... phosphorus it contains. Studies are to be conducted along this line.

In the nutrition experiments with peaches the trees receiving nitrogen over a period of years are markedly larger, more vigorous, and carry a greener foliage than those receiving no nitrogen. Also by far the greater effect in increasing yield has been shown on the nitrogen plants. During the last year the fruits on the trees fertilized with nitrogen were noticeably smaller in size, but not sufficiently so to injure the market quality, the larger number of ... more than offsetting the reduction in size. The peaches seemed firmer ... in better condition for long shipment.

The work with apples continued to show the superiority of nitrogen fertilizers ... young trees, although the trees fertilized with nitrogen were more subject ... blight. Blight was also found to be twice as prevalent on trees where cowpeas were grown and turned under the previous year as on plats where the trees were in timothy or alfalfa sod. Hence, it is concluded that where blight is destructive growers should use discretion in applying nitrogen fertilizer or in turning under leguminous crops. The results secured with fertilizers on older apple trees indicate in brief that the addition of fertilizer may or may not be profitable, depending on conditions in the individual orchard.

Among other investigations with fruits being conducted by J. C. Whitten work in breeding apples for late blooming habit was started. Planting tests of hardy fruit trees, such as the apple and pear, continued to show that fall planting ... uniformly much stronger growth than spring planting. During the last ... late fall planting gave better results than early fall planting and late spring ... gave better results than early spring planting. The sour cherry profits ... by fall planting, as compared with spring planting, than any other species ... has been tested. The past year's results showed that approximately two-... of the spring-planted cherry trees died, while there was no loss among ... planted in the fall. The surviving spring-planted trees made 25 per cent ... growth as the fall-planted trees.

Based on the yields secured from four crops, Ben Davis apple trees grown ... fruit buds selected from a productive parent have shown no superiority ... those selected from an unproductive parent. A similar experiment in straw

berry selection (E. S. R., 33, p. 236) covering a period of 10 years and [illegible] completed all to gave negative results.

Self-fertility studies of fruits by J. C. Whitten and C. C. Wiggans confirm the previous assumption that certain commercial varieties of apples have a tendency to self-fertility. Varieties such as Delicious, Ingram, Ben Davis, Gano, and York appear to be capable of fertilizing their own flowers when planted in large blocks.

Observations made on fruit trees in connection with tillage studies by J. C. Whitten and C. C. Wiggans indicate that the formation of fruit buds is induced by highly concentrated sap and wood growth, and lack of fruitfulness is indicated by less concentrated sap. In the tillage studies the tree sap was found to be more concentrated in orchards where cultivation is not extensive and where apparently greater competition with sod crops exists. Sap studies are to be conducted for a number of years with the view of determining a possible correlation between sap concentration and tillage methods.

The studies of fruit-bud development of trees as influenced by treatments and previous crops, conducted by C. C. Wiggans, confirm the conclusion previously drawn that only a small percentage of the spurs blossoms two years in succession and even a smaller percentage matures fruit two years in succession. It was found in every case where tests were made that the concentration of cortex sap from bearing spurs was greater than that from nonbearing spurs, if the determination was made during or soon after the fruiting season. Leaf sap from nonbearing spurs shows a higher concentration than leaf sap from bearing spurs. The high concentration of cortex sap from bearing spurs appears to exist only while the spur has fruit on it. Later the bearing spur comes back to normal concentration. So far as observed, there is no correlation between the number of leaves on a spur and its fruit development. Spurs bearing two or more fruits show little or no difference in sap concentration from those bearing only one fruit.

Examination of buds in winter for forecasting probable bloom, as made by C. C. Wiggans, indicates that it is possible to forecast the probable bloom of apple trees. Further observations are being made with the view of developing methods of forecasting that may be used by the average grower.

Protection of fruit against late spring frosts. A. D. BEELER (*U. S. Dept. Com., Com. Rpts., No. 221 (1917), p. 1101*).—A consular note on a new product, "agélarine" (antifrost), said to be a vegetable derivative compounded from the juices of certain plants. This material, it is claimed, has been successfully used for coating fruit trees, thereby retarding their blooming period without injuring the trees.

[Spray calendars] (*New Jersey Stas. Circs. 75–79 (1917), pp. 2 each*).—A series of circulars consisting of spray calendars for apples and quinces, pears, sweet cherries, plums, and peaches, as above numbered, respectively.

Blooming period of the apple in northwest Arkansas. W. H. WICKS (*Arkansas Sta. Bul. 134 (1917), pp. 3–12, figs. 3*).—This bulletin contains data collected in 1914, 1916, and 1917 to ascertain the blooming period of different varieties of apples. The work was limited to Washington and Benton Counties in northwest Arkansas. Records were kept by over 300 growers each year, in addition to records kept by the author.

A study of the data as a whole shows that the relative blooming period of varieties is not constant, that weather conditions preceding and during the blooming period exert an important influence on the earliness and length of the blooming period, and that varieties possess different degrees of susceptibility to climatic conditions. On certain slopes, elevations, and soils, and under cer-

... methods of culture the same varieties will begin to bloom a few days ... or later.

The varieties observed are classified according to time of blooming. A study ... data collected shows that the leading commercial varieties of the section, ... Ben Davis, Jonathan, Winesap, Grimes, and Mammoth Black Twig, all ... at about the same period, thus making it possible to secure the greatest ... of cross-pollination, provided there is mutual affinity between them. ... varieties of less commercial importance also bloom during the same period ... the leading varieties, and where bees are kept in or near the orchard the ... benefit from cross-pollination is assured.

The apple grading and packing law enacted by the Delaware legislature, ... (U. S. Dept. Agr. Bul., 6 (1917), No. 4, pp. 11–15).—The text of this law, ... came effective on June 1, 1917, is here given in full.

... tigations and experimental work carried on in cherry orchards in ... during the months of April and May, 1915–16, G. P. BERRY (*Jour. Bd. ... [London]*, 24 (1917), No. 3, pp. 288–298).—Notes are given on varieties of ... growing in Kent orchards, including information relative to their ... period and relative sterility or fertility when grown alone and in ... with other varieties. Some good pollenizers for the Early Rivers ... were determined by actual experiment.

A ... ts of the peach crop of 1917 in West Virginia, compiled by W. H. ... (W. Va. Dept. Agr. Bul. 26 (1917), pp. 24).—This comprises estimates ... 1917 season of the number of baskets of peaches in the various orchards ... West Virginia.

Report on fertilizer experiments with cranberries, F. P. SCHLATTER (*Proc. ... Cranberry Growers' Assoc., 48 (1917), pp. 9–12*).—A progress report on ... the experiments being conducted under the direction of the New Jersey ... Stations (E. S. R., 36, p. 641).

As a result of the work conducted during the past five years the author rec... the use of acid phosphate, rock phosphate, and bone meal for mud ... and iron ore bottoms. For sandy or savanna bottoms and possibly for ... having a heavy coat of sand on top, nitrate of soda, dried blood, ... meal, acid phosphate, basic slag, bone meal, and rock phosphate, ... or in proper and judicious mixtures, may prove of value. Potash ... probably no value. The use of sulphate of ammonia as a source of nitro... not recommended.

... Rate of cranberries after picking, C. L. SHEAR (*Proc. Amer. Cranberry ... Assoc., 48 (1917), pp. 6–9*).—A paper on this subject outlining the ... tive investigations conducted by the U. S. Department of Agriculture ... Massachusetts and New Jersey. The author briefly discusses spoilage due ... rots and premature death of the fruit caused by rapid ripening or ... ation.

First report on cacao selection in Assinan, G. HOMBURG and C. J. J. VAN ... (*Meded. Proefstat. Midden-Java, No. 27 (1917), pp. 7*).—A record is given ... yield of parent trees included in the selection study, together with notes ... condition of stock budded from these trees.

Additional observations on the citrus fruits in the Philippines, P. J. ... (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 2, pp. 104–115, ...*).—In continuation of a previous bulletin on citriculture in the Philippines ... S. R., 30, p. 644), observations are given on a number of species that have ... recently at the Lamao Experiment Station, including tabular data show... the degree of citrus canker affection in the station collection.

A ... contribution to the history of the mango in Florida, P. J. WESTER ... (*Philippine Agr. Rev. [English Ed.], 10 (1917), No. 2, pp. 146–149, ...*). This

contribution is based on the literature of the subject and on the data ass... by the author when connected with the subtropical garden in Miami, Fla.

The pistachio, R. FALCI (*Bol. R. Giard. Colon. Palermo, 3 (1916), No. 3, ... 128 184, pls. 6, figs. 3*). This comprises the results of a study relative t... biology, varieties, and culture of the pistachio in Sicily. A number of ... are appended showing the nature of the foliage and nuts of different sp... hybrids, and varieties.

Trees suitable for the farm and for ornamental purposes, W. E. Dow... (*Rhodesia Agr. Journ., 14 (1917), No. 4, pp. 487–499, pls. 3*).—A descriptio... is given of trees suitable for the farm and homestead in Rhodesia.

Plant materials of decorative gardening: The woody plants, W. Th... (*Urbana, Ill.: Author, 1917, pp. 204*).—A pocket guide to the genera ... usually the specific name of the hardy trees, shrubs, and woody climbe... cultivated in the eastern United States (except in the extreme South) ... northern Europe, exclusive of nurseries, botanical establishments, and pre... tious estates. In the generic descriptions more attention is given to ... bud, leaf-scar, foliage, and inflorescence than to the more transient d... flower and fruit on which botanical classification largely rests. The ... clature is in accord with that used in the Standard Cyclopedia of Horti... Other commonly used names are added as synonyms.

Annuals and biennials, GERTRUDE JEKYLL (*New York: Charles Scri... Sons, [1916], pp. XIV+174, pls. 44*).—Part 1 of this volume discusses ... ways of using annuals and biennials, raising annuals in greenhouse or ... annuals and biennials for autumn sowing, annuals as edgings, color s... with annuals, hedge-forming and climbing annuals, annuals in the rock ... sweet scented annuals, and annuals and biennials for use as cut flowers. ... comprises an alphabetical list, with description and culture, of the best ... and biennials. In part 3 a chart of color and height together with s... for various purposes and aspects are given.

Garden flowers of spring, ELLEN E. SHAW (*Garden City, N. Y.: Doub... Page & Co., 1917, vol. 1, pp. 230, figs. 217*).—This is the first of a series ... volumes constituting the Pocket Garden Library, edited by L. Barron. ... present volume contains descriptions with illustrations in color of ... flowers of spring.

Garden flowers of summer, ELLEN E. SHAW (*Garden City, N. Y.: Doub... Page & Co., 1917, vol. 2, pp. 251, figs. 238*).—A volume similar to the above ... scribing garden flowers of summer.

Garden flowers of autumn, ELLEN E. SHAW (*Garden City, N. Y.: Doub... Page & Co., 1917, vol. 3, pp. 195, figs. 185*).—A volume similar to the above ... scribing garden flowers of autumn.

Flowers of winter, indoors and out, M. FREE (*Garden City, N. Y.: Doub... Page & Co., 1917, vol. 4, pp. 206, figs. 196*).—A volume similar to the above ... scribing flowers of winter, indoors and out.

The livable house.—Its garden, RUTH DEAN (*New York: Moffat Yard & ... 1917, vol. 2, pp. XVI+174, figs. 107*).—This is one of a series of volumes ... with the home and its surroundings. The successive chapters discuss ... grounds as a whole; general planting; the flower garden; spring planting; ... shrubs, flowers, bulbs, fall planting, and pruning; and garden architecture.

How to make concrete garden furniture and accessories, edited by J. ... FALLON (*New York: Robert M. McBride & Co., 1917, pp. XVIII+105, pls. 15, ... 88*).—A treatise on the use of concrete in the garden. It discusses the s... and testing of material; how to proportion and mix the materials; ... forms and placing the concrete; how to make garden walls, steps, and ... simple utilities; how to make sundials, benches, swimming pools, bird ...

...rns, pottery, and water gardens; and making concrete garden frames and ... rollers.

FORESTRY.

General survey of Texas woodlands, including a study of the commercial ... ities of mesquite. J. H. FOSTER, H. B. KRAUSZ, and A. H. LEIDIGH (*Bul. ... Mech. Col. Tex., 3. ser., 3 (1917), No. 9, pp. 47, figs. 20*).—This com... a general survey of forest and woodland conditions in TEXAS, including ... discussion of the geography, soil, and climate of the State. Data on a ... of the commercial possibilities of mesquite, made by H. B. Krausz, are ... given.

Forest resources of eastern Texas, J. H. FOSTER, H. B. KRAUSZ, and G. W. ... N (*Bul. Agr. and Mech. Col. Tex., 3. ser., 3 (1917), No. 10, pp. 57, figs. ...*).—Data are given on the forest resources, industries, and outputs by counties ... east Texas timber belt.

The Patagonian forests, M. ROTHKUGEL (*Los Bosques Patagónicos. Buenos ... Min. Agr., 1916, pp. 207, pls. 23, figs. 99*).—This embraces the results of ... reconnaissance of the forest regions of Patagonia. Information is given rela... the general distribution of the forests, distribution by species, data on ... and yield from different stands, lumbering conditions and activities, ... probable future distribution of commercial species. The more important ... are considered in detail, and a number of maps are appended showing ... distribution.

Timber estimating methods used in eastern North Carolina, H. R. KRINBILL ... *Farm. 4 (1917), No. 2, pp. 13–21*).—A descriptive account illustrating ... application of these methods on various timber tracts.

Fourth annual report of the State forester to the governor for the year ... December 31, 1916, F. A. ELLIOTT (*Ann. Rpt. State Forester Oreg., 6 ... pp. 30, fig. 1*).—A report on forest fire protection work during the year ... December 31, 1916.

Forestry, J. A. VIQUESNEY (*Biem. Rpt. Forest, Game and Fish Warden W. Va., ... pp. 39–89, pls. 4, figs. 26*).—A report of forest activities in West Vir... the biennial period ended July 1, 1916, including a discussion of State ... fire protection, the character of the fire season, and the assistance ... by private landowners, railroads, and rural mail carriers. A plan ... by F. S. Bryant for fire protection by the State of West Virginia in ... with the southern West Virginia fire protective association is here ... cited.

Law of the woods and yerbales (*Ley de Bosques y Yerbales. Buenos Aires, ... Min. Agr. Nac., 1915, pp. 91, pls. 3*).—This comprises the text of a proposed ... law for Argentina as presented to the National Congress, Buenos Aires, ... September 30, 1915.

Amendments to the Central Provinces Forest Manual (third edition) ... *India: Govt., 1915–1917, pp. [67]*).—This comprises various additions, ... tions, and corrections to the manual previously noted (E. S. R., 36, ...).

On the sun and shade leaves of some trees, T. DOI (*Jour. Col. Sci. Imp. ... Tokyo, 40 (1917), Art. 1, pp. 37, pl. 1, figs. 4*).—A contribution to the ... of leaf structure as influenced by light and shade, based on investiga... of plants and trees growing in the botanic garden of the Imperial Uni... of Tokyo.

The carob and its rational culture, G. AMICO (*Il Carrubo Coltivato Razional... Catania: F. Battiato, 1916, pp. 103, fig. 1*).—An account of the carob

(*Ceratonia siliqua*) with reference to its distribution; botany; varieties; propagation; flowering, pollination, and fruiting; culture; commercial importance; and economic uses. The work has been written with special reference to the extension of carob culture in Italy.

The black wattle industry.—Acacia mollissima, A. decurrens var. mollis, T. R. SIM (*So. African Jour. Sci., 13 (1917), No. 7, pp. 279–301*).—A general and statistical account of the black wattle tanbark industry in Natal.

Catalogue of the wood specimens exhibited in the economic section. T. V. NARASINGA RAO (*Madras: Govt. Museum, 1916. pp. VI+114*).—A catalogue of the wood specimens exhibited in the Madras Government Museum, giving the common names of the wood, distribution, characteristics, and uses.

The grouping of ties for treatment. C. P. WINSLOW (*Proc. Amer. Wood Preservers' Assoc., 13 (1917), pp. 386–413, figs. 3*).—A paper presented at the annual meeting of the American Wood Preservers' Association in New York City in January, 1917, and discussing the proper grouping for preservative treatment of woods used as railroad ties.

Paper and wood pulp industry. W. A. RUFF (*Bur. of the Census [U. S.] Census of Manfr. 1914, Paper and Wood Pulp, pp. 19*).—This comprises a summary of the principal statistics for the paper and wood pulp industry as a whole for 1914 and 1909, together with special statistics relating to materials, products, equipment, imports, and exports.

Forest products of Canada, 1916. Pulpwood (*Dept. Int. Canada, Forestry Branch Bul. 62B (1917), pp. 13, figs. 7*).—A statistical account of the pulpwood consumption in Canada in 1916. The Canadian mills consumed 1,761,912 cords valued at $13,104,458, while 1,068,207 cords valued at $6,866,669 were exported.

DISEASES OF PLANTS.

New or interesting species of fungi. H. D. HOUSE (*N. Y. State Mus. Bul. 188 (1916), pp. 29–58, pls. 4*).—Among other fungi this list includes, as more or less parasitic on economic plants, the new species *Cercospora caricis* on *Carex folliculata*, *Cercospora lathyri* on *Lathyrus maritimus*, *Glaeosporium ulmicola* on *Ulmus rugosa*, *G. falcatum* on *Benzoin æstivale*, *G. hydrophylli* on *Hydrophyllum canadense*, *Phoma pectinata* on *Abies pectinata*, *Phyllosticta steironematis* on *Steironema ciliatum*, *Ramularia cichorii* on *Cichorium intybus*, *Scolecosporium coryli* on *Corylus americana*, *Septoria mollisia* on *Antennaria neodioica* and *A. canadensis*, *S. tenuis* on *Carex tenuis*, *Stagonospora convolvuli* on *Convolvulus sepium*, and *Dothidella vaccinicola* on *Vaccinium atrococcum*; the newly named form *Phoma humeliæ* (*P. (Sphæropsis) maculans*) on Bumelia; and the newly formed combination *Septoglæum ochroleucum* (*Septoria ochroleuca*) on *Castanea dentata*.

Texas parasitic fungi.—New species and amended descriptions, B. C. THAXP (*Mycologia, 9 (1917), No. 2, pp. 105–124*).—The pathogenic fungi described in this article, collected in 1914 to 1916 near Austin and in several points in east and northeast Texas, include, besides some previously known, the new species *Ascochyta boerhaaviæ*, *Cercospora acalypharum*, *C. ammanniæ*, *C. apiifoliæ*, *C. arboriæ*, *C. bidentis*, *C. bliti*, *C. capitati*, *C. carolinensis*, *C. erythrinicola*, *C. ficina*, *C. helenii*, *C. hydrangeana*, *C. marrubii*, *C. mirabilis*, *C. modiolæ*, *C. nelumbonis*, *C. nigri*, *C. nyssæ*, *C. piaropi*, *C. populicola*, *C. pulcherrimæ*, *C. regalis*, *C. rosigena*, *C. salviicola*, *C. texensis*, *C. toræ*, *Colletotrichum cinnamomi*, *Contothyrium rhois*, *C. ulmi*, *Exosporium liquidambaris*, *E. platanorum*, *E. phoradendri*, *Napicladium prosopodium*, *Phleospora pteleæ*, *Phyllachora texana*, *Phyllosticta cephalanthi*, *P. euonymi*, *P. verbenicola*, *Ramularia acalyphæ*, *R. salviicola*,

... angularis, S. antirrhinorum, S. argemones, S. asterina, S. hicoriæ, ... and S. wistariæ; and the new varieties *Cercospora euphorbiæcola ...* and *C. pulcherrimæ minima.*

Uredinales of Porto Rico based on collections by H. H. Whetzel and E. W. Olive. J. C. ARTHUR (*Mycologia, 9 (1917), No. 2, pp. 55–104*).—Following the ... of fungus material during the spring of 1916 by Whetzel and Olive ... systematic study by the author, 122 species of the Uredinales are listed. ... of these are regarded as new species or treated as new combinations, ... being of more or less importance in connection with ornamental or useful ... A list is given of species previously reported from Porto Rico.

A short-cycled Uromyces of North America. G. R. BISBY (*Abs. in Phytopathology, 7 (1917), No. 1, p. 74*).—It is claimed that there are only 11 species ... cycled Uromyces found in North America and that these are parasitic ... families of monocotyledons and dicotyledons.

A systematic and physiological study of rusts. G. M. REED, C. R. HURSH, W. E. BRENTZEL (*Missouri Sta. Bul. 147 (1917), p. 28*).—A report is given ... under greenhouse conditions of 46 varieties of oats belonging to 9 ... of Avena to determine their susceptibility to the crown rust of oats (*... coronifera*). Only one variety showed any degree of resistance and ... the rust developed to maturity. Additional tests were made with a ... of species of grasses, and although the different grasses are known to ... of the rust *P. coronifera*, no infection was obtained by using uredospores ... this result indicating the existence of physiological races in this rust. ... are briefly reported on rust infection on varieties of wheat. With few ... the varieties tested were all found badly infected with orange leaf ... (*P. triticina*).

A fundamental study of the physiological relation of the powdery mildews to their hosts. G. M. REED (*Missouri Sta. Bul. 147 (1917), p. 27*).—The author ... the results of previous investigations (E. S. R., 35, p. 651) in which ... the relation of powdery mildew to varieties of Triticum and Avena. ... to the data previously reported, it is stated that a large number of ... have been conducted with varieties of barley in relation to barley ... most of the varieties tested proving quite susceptible.

Control of Phytophthora infestans in the floating gardens of Xochimilco. ... MENDIOLA and R. VILLARREAL (*Bol. Dir. Agr. [Mex.], 2 (1916), No. 2, pp. ...*).—This is a discussion of local conditions affecting the success of cultivated plants in the floating gardens, more particularly the tomato, as affected by ... blight, with suggestions for protection against that fungus.

Economic hosts of Sclerotinia libertiana in tidewater Virginia. J. A. MCCLINTON (*Abs. in Phytopathology, 7 (1917), No. 1, p. 60*).—In the warm, ... climate of tidewater Virginia, *S. libertiana* is said to be a serious parasite of lettuce, snap beans, tomatoes, winter-grown parsley, cauliflower, and ... plants.

A new strain of Puccinia graminis. E. C. STAKMAN and F. J. PIEMEISEL (*... in Phytopathology, 7 (1917), No. 1, p. 73*).—The authors report a rust ... behaves differently from any of the common biologic forms of *P. graminis*. ... has recently been found on club wheat and a number of wild grasses, and ... to occur only west of the Rocky Mountains in Idaho and Washington, ... seems to take the place of ordinary *P. graminis tritici*.

Grain-smut investigation and control. G. M. REED (*Missouri Sta. Bul. 147 ... pp. 27, 28*).—Inoculations with spores of *Sphacelotheca sorghi* were ... on 22 varieties of sorghum, including broom corn, kaoliang, and Kafir corn, ... which, feterita, Jerusalem corn, dwarf milo maize, and milo maize,

remained free from infection, while all the others gave percentages of infection ranging from less than 1 to 31.

Inoculation experiments with bunt (*Tilletia fœtens*) on 15 common varieties of wheat gave infection in all cases, the amount ranging from 8.3 to 62.8 per cent. The effect of date of planting on amount of infection was also tested, planting being made from October 2 to October 30, and it was found that seed planted latest in the year gave the highest degree of infection.

Other infection experiments are reported with oat smuts (*Ustilago avenæ* and *U. levis*), 38 varieties belonging to 10 species of Avena being inoculated with spores of both smuts. Most of the hosts became infected, the percentage of infection varying from less than 2 to more than 88. *A. barbata*, *A. brevis*, and *A. strigosa* remained entirely free from the smuts. Of the common varieties of oats, a few, notably Burt and Early Ripe, remained practically free from infection.

Ecological observations on Ustilago zeæ, A. A. POTTER and L. E. MELCHERS (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 73, 74*).—It having been reported that the nodal buds of maize were particularly subject to smut, the authors made an investigation of the matter. They report that conidia probably do not infect the corn plant directly, but that the result is rather the development of a virulent culture of the fungus in the leaf axil. A plant thus infected may become a center for aerial distribution, or, when rain occurs, the conidia may be washed down or splashed on other leaves.

The formalin treatment for controlling oat smut, J. A. KRALL (*Proc. Iowa Acad. Sci., 23 (1916), pp. 593–620*).—Describing the loss annually caused by oat smut in Iowa and reviewing briefly the history and literature of oat-smut control measures, the author reports on his own experiments with treatments. Various fungicidal preparations were employed unsuccessfully as contrasted with formalin, 1 pt. of which to 20 gal. of water controlled the smut without materially decreasing the vitality of the seed. A bibliography is appended.

Some new facts concerning wheat smut, F. D. HEALD (*Proc. Wash. State Grain Growers, Shippers and Millers Assoc., 10 (1916), pp. 38–45, figs. 2*).—Stinking smut, one of three types of smut that attack wheat, is the only one now serious in Washington. Recent studies have been noted in part (E. S. R. 34, p. 644). Two new features which stand out with special prominence are the occurrence of partially smutted grains and a general and extensive wind dissemination of the spores. These are discussed in connection with some of the better-known facts.

All or part of the heads of a stool may be smutted, and in a given head the smutting may be total or partial, showing wide variation. There is also great variation in the position and size of the smut mass in partially smutted grains. These grains in seed wheat would rarely be removed in cleaning, nor would the spores be killed by ordinary fungicidal treatment, and it is thought that a certain number will grow, vitiating the results from seed treatment. Fields may become infected by wind-blown spores. The spores of unbroken smut balls are not reached by fungicides, and will retain vitality in the soil for a year or more, though after liberation few remain alive for more than three months in moist soil and none of these are able to survive the winter. The records of spore traps show that during the thrashing period and the two weeks that follow there are probably many smut showers, the summer-fallowed fields becoming thickly strewn with spores borne by the wind.

The prevention of wheat smut, H. M. WOOLMAN (*Proc. Wash. State Grain Growers, Shippers, and Millers Assoc., 10 (1916), pp. 45–49*).—In continuation of the above discussion, the author states that although it is practically impossible by any one process to clean a very smutty lot of seed perfectly, the

... fanning-mill process, together with the open tank employing copper ... and salt or formaldehyde, will probably prove to be the best available ... control through seed treatment. However, this is admittedly inade... to guard against the presence of partially smutted kernels.

Crop rotation is the best remedy for smut left in the field from former wheat ... the rotation of oats, barley, or spring wheat with summer fallow being ... as fairly safe. Continuous alteration of wheat and summer fallow ... be avoided. Deep plowing seems to help also, as will any operation on ... stubble tending to crush the smut balls. Burning is advised in case of ... stubble. Wind dissemination may occasionally be the sole cause of a ... crop. Details of experiments regarding the viability of spores in ... soil under varying conditions are considered to indicate that very early or ... late sowing and replowing the summer fallow have considerable advan...

Another method suggested is tillage of the fallow after rains. Seed should be planted when the temperature is high.

Puccinia graminis on wheat kernels and its relation to subsequent infection, C. W. HUNGERFORD (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 78*).—The author briefly reports experiments carried on at Madison, Wis., to determine whether *P. graminis* is able to infect wheat through the seed. Although the work has not been fully completed, the results so far obtained are considered to show that seed wheat infected with *P. graminis* does not cause infection of the wheat plant. Similar experiments have been started in cooperation with the Oregon Experiment Station with wheat infected with *P. glumarum*.

The Pseudopeziza leaf-spot diseases of alfalfa and red clover, F. R. JONES (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 70*).—Studies have been made of the Pseudopeziza leaf spots of alfalfa and red clover to determine possible relationships of the parasites as well as other facts regarding their life history.

The author reports having found that both fungi may be obtained in pure culture, slight morphological and distinct physiological differences having been observed. Only ascospores have been found to be produced in nature, while conidialike structures occurred in cultures. The germinating ascospores are said to penetrate the epidermal cells directly, the mycelium developing within the host cells and penetrating the cell walls. The fungus is considered to overwinter on dead leaves which escape decay, and ascospores developed either in old or new apothecia are a source of spring infection.

Experiments in the disinfection of alfalfa seed have shown that this treatment can not be depended upon for the prevention of leaf spot.

Bean mosaic, V. B. STEWART and D. REDDICK (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 61*).—The authors report the extensive occurrence in New York in 1916 of a mosaic disease of beans, in some instances practically every plant being affected and the plants rarely setting pods. The disease was most frequently observed on pea beans, but other varieties of both dry and snap beans showed some infection. Evidence has been obtained which indicates that the disease is seed borne and may be readily transferred by inoculation.

Lima bean mosiac, J. A. MCCLINTOCK (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, pp. 60, 61*).—The author reports having observed over 25 per cent of several hundred plants of certain varieties of lima beans which were stunted and bore the dwarfed, mottled, wavy leaves characteristic of mosaic. The disease is serious, because the yield on infected plants is greatly decreased and the pods are smaller and malformed.

The celery-rot bacillus, H. WORMALD (*Jour. Agr. Sci. [England]*, *8* (*1917*), *No. 2, pp. 216–245, pls. 2*).—The author, in pursuance of an account previously given of a celery rot (E. S. R., 34, p. 244), states that the cause of this rot

is a bacillus which is described as differing only in minor respects from *Bacillus carotovorus*. Other common vegetables are also susceptible to attack by the organism, which is itself very sensitive to antiseptic and germicidal reagents, also to desiccation.

The development of the æcial stage of Nigredo on red clover, I. E. Melhus and W. Diehl (*Abs. in Phytopathology, 7 (1917), No. 1, p. 70*).—Experiments have shown that the uredospore stage of *N. fallens* developed readily on red clover grown in greenhouses when the plants were about 6 in. tall. Subsequently, æcia were observed, and during a period of about two weeks the æcial stage became abundant and continued to develop for about a month when the temperature of the house was raised by increased sunshine.

White clover, alsike, and crimson clover in close proximity to the infected red-clover plants remained free from infection. Repeated attempts to transfer the rust to these hosts were without result, and it is believed that *N. fallens* is autœcious and not heterœcious as heretofore reported.

The æcial stage of the red-clover rust, W. H. Davis and A. G. Johnson (*Abs. in Phytopathology, 7 (1917), No. 1, p. 75*).—The observations and experiments of the authors are considered to have shown that the red-clover rust (*Uromyces fallens*) is a long-cycled, autœcious species, with pycnia, æcia, uredinia, and telia on the same host.

Two transmissible mosaic diseases of cucumbers, I. C. Jagger (*Abs. in Phytopathology, 7 (1917), No. 1, p. 61*).—The author states that in addition to the mosaic disease known as white pickle, which has been previously described (E. S. R., 36, p. 350), a second distinct mosaic disease was observed in the vicinity of Rochester, N. Y. This disease is characterized by a mottling of the leaves, but shows no effect on the fruit. It has been repeatedly transmitted to healthy plants by rubbing them with crushed diseased leaves, and has also been transmitted to muskmelons and to summer crookneck squashes.

A Gnomonia on eggplant, C. W. Edgerton (*Abs. in Phytopathology, 7 (1917), No. 1, p. 78*).—The author reports having observed a species of Gnomonia on old eggplant stems during the winter season at Baton Rouge La. The fungus has been repeatedly cultured and found similar to, if not identical with, the fungus causing eggplant blight (*Phyllosticta hortorum*). Inoculation experiments, however, have always given negative results. While it is possible that there may be no connection between the two, it is very probable that they are closely related species.

A malnutrition disease of the Irish potato and its control, H. A. Edson and O. Schreiner (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 70, 71*).—The authors report the occurrence, in potato fields from Maine to Virginia during the summer of 1916, of a disease of potatoes characterized by a downward curling of the leaf margins accompanied by a bronzing and later a browning but not a yellowing of the foliage. Death of the leaves and sudden collapse of the stems at the ground level followed. Fungi appeared at and above the point of collapse, but investigations indicate that they are only weak parasites acting as contributing factors and that the primary cause of the trouble is malnutrition resulting from insufficient potash or perhaps an excess of nitrates in the presence of a minimum potash supply. In Maine the disease appears to be correlated with certain soil types and certain varieties, though not entirely so. The use of stable manure was found to be an excellent corrective.

The economic importance of mosaic of potato, P. A. Murphy (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 72, 73*).—As a result of his investigations the author concludes that in an average crop of 300 bu. per acre there is a loss of 1½ bu. per acre for every 1 per cent of mosaic present. The eating qualities of potatoes produced by mosaic plants are said to be unimpaired.

Strains of Rhizoctonia, J. ROSENBAUM and M. SHAPAVALOV (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 74, 75*).—The authors report having isolated from potato stems a strain of Rhizoctonia which had produced a girdling and hollowing of the stems at or near the surface of the ground. Inoculation and culture experiments with this organism revealed certain characteristics, and it is considered possible that different strains of Rhizoctonia may offer an explanation of the conflicting reports regarding artificial infection.

Will Spongospora subterranea prove serious in Virginia? J. A. MCCLINTOCK (*Abs. in Phytopathology, 7 (1917), No. 1, p. 72*).—As a result of planting in Virginia potatoes affected with powdery scab, the author concludes that powdery scab will not be prevalent either on the spring or on the fall planted potatoes even though the seed tubers are infected with the organism.

Host plants of Synchytrium endobioticum, A. D. COTTON (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 10 (1916), pp. 272–275*).—It is said to have been proved beyond doubt that certain potato varieties are absolutely immune to the wart disease organism, *S. endobioticum*. No varieties which appeared resistant after thorough tests have broken down in this respect.

Other plant hosts, however, have been discovered. A few minute sporangia of the wart disease have been known to form on *Solanum dulcamara* and on *S. nigrum*. It is thought that the latter constitutes a greater danger than the former. It is considered as possible that the organism may have spread from wild Solanums to potato in Hungary, where the disease is said to have been first described.

Bordeaux spray for tip burn and early blight of potatoes, A. T. ERWIN (*Ohio Sta. Bul. 171 (1917), pp. 62–75, pls. 2, figs. 6*).—Results are given of five years' experiments with tip burn and early blight of potatoes to determine whether, under corn-belt conditions, these diseases can be dealt with profitably by spraying with Bordeaux mixture.

The author has found that three applications of Bordeaux mixture gave an average annual increase of 10 bu. per acre, five applications 20 bu. per acre, and seven applications 22 bu. per acre. Basing his conclusions on these results, he recommends five sprayings with Bordeaux mixture, the first early in July, the applications to be repeated at approximately 10-day intervals.

A discussion is given of early blight and tip burn, their causes, temperature relations, etc.

Seed potato certification in Nova Scotia, P. A. MURPHY (*Abs. in Phytopathology, 7 (1917), No. 1, p. 72*).—A brief account is given of the method adopted in Nova Scotia for producing seed potatoes for the Bermuda seed trade.

Root disease of sugar cane, J. R. JOHNSON (*Hacienda, 12 (1917), Nos. 4, pp. 117, 118, figs. 2; 5, pp. 146, 147, fig. 1*).—This is a discussion of the destructive root disease of sugar cane, supposed to be caused primarily by *Marasmius sacchari* (though other fungi may be present), with suggestions for lessening injury therefrom, including such measures as insect control, soil selection and management, drainage, rotation, and resistance.

Tobacco diseases and their control, J. R. JOHNSON (*Hacienda, 11 (1916), No. 12, pp. 372–374, figs. 3; 12 (1916), Nos. 1, pp. 26–28, figs. 3; 2, pp. 63, 64, figs. 3; 3, pp. 91–93, figs. 2; 12 (1917), No. 4, pp. 124–126, figs. 2*).—Descriptions are given of several diseases, rots, or other sources of loss affecting the tobacco plant during its life or preparation for storage or market.

A Colletotrichum leaf spot of turnips, B. B. HIGGINS (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 4, pp. 157–162, pls. 2*).—The attention of the author, at the Georgia Experiment Station, was called in 1914 to a leaf-spot disease of young turnip plants near Macon, Ga. The spots are said to be ¼ in. or less in diameter, circular in outline, and of a pale green or straw color. The

disease also attacks the stems and seed pods, but experiments indicate that the fungus is not carried over in the living seed.

The organism causing the disease has been isolated and inoculation experiments have proved its pathogenicity. The organism is described by P. A. Saccardo as *C. higginsianum* n. sp. The author believes that the disease occurs in various portions of Georgia.

Temperature relations of apple rot fungi, C. Brooks and J. S. Cooley (abs. *in Phytopathology*, 7 (*1917*), *No. 1, p. 76*).—It is stated that most apple rot fungi will grow at a lower temperature on corn-meal agar than on fruit and at a lower temperature on ripe fruit than on green fruit. With several, if not all, of the storage-rot fungi the initial stages of rotting are found to be more inhibited at low temperatures than is the germination of the spores. Various rots may finally make a fairly rapid development at temperatures at which the fungus is at first barely able to make a start. Even at favorable temperatures most of the fungi pass through a period of incubation on apples that is not evident on culture media.

Black root rot of the apple, F. D. Fromme and H. E. Thomas (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 4, pp. 163–174, pls. 3, fig. 1*; abs. in *Phytopathology*, 7 (*1917*), *No. 1, p. 77*).—The authors give a detailed account in continuation of a previous note (E. S. R., 36, p. 649), of their investigations at the Virginia Experiment Station on the black root rot of the apple, which is said to be an infectious disease of considerable economic importance in the orchard sections of Virginia.

No prominent leaf characters have been observed for the disease, but the black encrustations on the surface of affected roots and the accompanying dark zonations in the bark and wood are considered reliable diagnostic characters. Field observations show that the root rot is infectious but that its progress is comparatively slow. Apple trees planted on newly cleared land are said to be more liable to attack than those on land cleared and cultivated for some time prior to planting.

Three species of Xylaria have been obtained in pure cultures from the apple roots, *X. hypoxylon*, which proved to be an active wound parasite, *X. polymorpha*, which seems to be only slightly pathogenic, and an undetermined species. *X. hypoxylon* is considered the chief cause of the root rot in Virginia.

Exclusion of the fungus, proper attention to cultivation, and elimination of contact with stumps of forest land are recommended as control measures.

Treatment of apple canker diseases, J. C. Whitten (*Missouri Sta. Bul. 137 (1917), pp. 43, 44*).—In a previous publication (E. S. R., 35, p. 848), the author reported the checking of about 90 per cent of apple tree cankers by the use of copper sulphate or corrosive sublimate. Observations have been continued during the past year to determine whether the cankers would break out again, but no further progress has been noticed in wounds which were apparently healed during 1913 and 1914.

In connection with this treatment, the author reports that mixing corrosive sublimate with paint has proved as effective in controlling canker as treating the scraped parts with the disinfectant and later painting for protection. In this treatment, the corrosive sublimate is dissolved in turpentine and mixed in proper proportion into the paint.

Jonathan spot, C. Brooks and J. S. Cooley (*Abs. in Phytopathology*, 7 (*1917*), *No. 1, p. 76*).—The authors claim that Jonathan spot increases up to a temperature of 20° C. (68° F.), but it is entirely inhibited at 30°. The disease, it is said, can be readily produced in saturated air in closed moist chambers but seldom develops in a stirred air of 70 to 95 per cent relative humidity.

Control of apple scab by bleaching powder, W. S. BROCK and W. A. RUTH (*Abs. in Phytopathology, 7 (1917), No. 1, p. 76*).—The authors claim that the application of bleaching powder (calcium hypochlorite) to apple trees in 1916 reduced apple scab from 50 to 11.2 per cent without any injury to fruit or foliage.

Observations on pear blight in Illinois, F. L. STEVENS, W. A. RUTH, G. L. PARKER, and J. R. MALLOCH (*Abs. in Phytopathology, 7 (1917), No. 1, p. 75*).—Experiments made by applying *Bacillus amylovorus* in suspension in water to buds in 1915 are believed to have indicated in 1916 that the bacilli did not survive in the buds. Infection of the spurs from hold-over trunk cankers appeared in 1916, but the organism appeared to be dead in all twig cankers. Leaves are said to be at no time naturally infected from the exterior, and on cut blades and pedicles could not be inoculated through the fruit while pedicels were still susceptible. The application of Bordeaux mixture is said to have controlled the floral infection without reducing the set of fruit.

Studies on peach yellows and little peach, M. A. BLAKE, M. T. COOK, and C. A. SCHWARZE (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 76, 77*).—The results of investigations on these diseases are briefly described, and it is claimed that pits from diseased trees failed to germinate. Budding experiments with diseased buds indicate that the appearance of the disease in young trees varies with the source of bud wood.

Second progress report on investigations of leaf spot of cherries and plums in Wisconsin, G. W. KEITT (*Abs. in Phytopathology, 7 (1917), No. 1, pp. 75, 76*).—In continuation of investigations on the leaf spot due to *Coccomyces hiemalis* (E. S. R., 36, p. 149), the author reports having found that the trouble is satisfactorily controlled by the use of Bordeaux mixture of various strengths and lime-sulphur. Atomic sulphur, barium-sulphur, and self-boiled lime-sulphur in parallel applications did not control the disease satisfactorily.

A new disease of cacao, M. TURCONI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis. Mat. e Nat., 5. ser., 26 (1917), 1, No. 1, pp. 75–78*).—In a preliminary note the author records the occurrence on *Theobroma cacao*, in the botanical garden of Pavia, of a leaf spot fungus described as a new species under the name *Phyllosticta theobromæ*, and of two associated fungi also described as new, which receive the respective names, *Stachylidium theobromæ* and *Helminthosporium theobromæ*.

Diseases of chayote, R. RAMÍREZ (*Bol. Dir. Agr. [Mex.], 2 (1916), No. 2, p. 57, pl. 1*).—The chayote is subject to injury by Cuscuta, *Helix humboldtiana*, a disease affecting leaves and fruits associated with a Sphærella presumably as a primary agent and with several fungi named as secondary.

Mango disease in Yucatan, R. RAMÍREZ (*Bol. Dir. Agr. [Mex.], 2 (1916), No. 2, pp. 59, 60, pls. 2*).—A disease attacking branchlets, flowers, and fruits of mango, also other plants, is described as due to *Glœosporium mangiferæ*.

Additional suggestions on treatment of hazel blight, M. B. WAITE (*Amer. Nut Jour., 3 (1915), No. 6, p. 97*).—The same treatment is recommended for hazel blight that has been found successful with black knot of plum and cherry, which yields to cutting out the blighted portions in February or early March before the spores have matured, and applying a dormant spray of Bordeaux mixture. Eradication of wild hazel is also considered important.

Winterkilling, sun scald, or sour sap of pecans, S. M. MCMURRAN (*Amer. Nut Jour., 3 (1915), No. 5, p. 82*).—This is a descriptive account of the influence of cold weather succeeding warm days in November as causing injury or death to pecan trees which had renewed growth in the fall after a serious check due

to summer drought. Wrapping the trees with sacking for about 4 ft. above the ground practically prevented the trouble.

Notes on pecan diseases, S. M. McMurran (*Amer. Nut Jour.*, 4 (*1916*), *No. 6, pp. 81, 86, figs. 3*).—In a block of pecan trees sprayed for scab with Bordeaux mixture five times about two weeks apart, from May 29 to August 8, 1914, the brown leaf spot disease (*Cercospora fusca*) was effectively controlled, while the unsprayed trees were almost defoliated by September. Nursery leaf blight (*Phyllosticta caryæ*) was controlled with from three to five sprayings. A premature defoliation of pecan occurring in southern Louisiana in late summer appeared to be associated with water supply. A dieback observed at a point in Louisiana and one in Georgia were apparently due to soil and seasonal conditions. Black pecan nut disease said not to have been described previously, is thought to be nonparasitic in character.

Blight and melaxuma of walnut, C. W. Beers (*Amer. Nut Jour.*, 4 (*1916*), *No. 2, pp. 18, 19, 21, figs. 3*).—Both blight and melaxuma of walnut are reported to have been brought under study and control.

An investigation of forest tree diseases, G. M. Reed, Lucile Keene, Jessie Cline, and Emily Hardesty (*Missouri Sta. Bul. 147 (1917), pp. 28, 29*).—The authors report having collected a number of polyporous fungi on living trees during the year, among them *Fomes fraxinophilus* on ash, *F. robiniæ* on black locust, and *F. everhartii* on oak. Studies on fungi connected with the decay of fence posts are said to be in progress.

Boleti and mycorrhiza upon forest trees and an unusual mycorrhiza upon white oak, L. H. Pennington (*Abs. in Phytopathology, 7 (1917), No. 1, p. 74*).—Six species of Boletus are reported as connected with mycorrhiza of forest trees, usually oaks. A peculiar form of mycorrhiza found upon white-oak roots is briefly described. Attempts to inoculate the roots of other trees with this fungus have thus far failed.

Blight-resistant chestnuts from China, G. H. Corsan (*Amer. Nut Jour.*, 7 (*1915*), *No. 4, p. 54, figs. 2*).—The author notes the observations made by Meyer in the course of studies carried out by him in northern China (E. S. R., 35, pp. 29, 140) regarding the high resistance of a Chinese chestnut (*Castanea mollissima*) to chestnut blight, the wounds caused by the attack on this species healing spontaneously.

Breeding chestnuts for disease control (*Amer. Nut Jour.*, 4 (*1916*), *No. 4, pp. 56, 57, figs. 4*).—Brief mention is made of work in progress in the testing of hybrids between the American native chinquapin and Japanese chestnut. The F_1 and F_2 hybrids are highly resistant to the chestnut bark disease and show other desirable characters, as do also four generations of hybrids between Japanese and Chinese chestnuts.

Violent outbreak of Oïdium on oak in France, E. Noffray (*Jour. Agr. Prat. n. ser., 29 (1916), No. 19, p. 326*).—A brief description is given of the mode of attack by Oïdium on oak, which, it is said, has not ceased since the time of its introduction to cause damage and which is becoming serious in Sologne.

Oïdium on oak, F. Convert (*Jour. Agr. Prat., n. ser., 29 (1916), No. 20, pp. 343, 344*).—The author, replying to the article noted above, states that an American oak which does well in France is resistant to Oïdium.

American oaks resistant to Oïdium in Sologne, E. Noffray (*Jour. Agr. Prat. n. ser., 30 (1917), No. 8, pp. 54, 55*).—Following up the information noted above, the author made examination of a number of oaks of the American species *Quercus palustris* in Sologne, finding them practically free from attack by Oïdium.

A species of Chrysomyxa new to North America, H. S. JACKSON (*Abs. in Phytopathology, 7 (1917), No. 1, p. 78*).—The author reports a short-cycled form referable to the genus Chrysomyxa occurring on leaves of *Picea engelmannii*.

Mycelium of the white pine blister rust, R. H. COLLEY (*Abs. in Phytopathology, 7 (1917), No. 1, p. 77*).—The author describes some of the morphological characters of the mycelium of *Cronartium ribicola* as it occurs on the white pine.

Pycnial scars, an important diagnostic character for the white pine blister rust, R. H. COLLEY (*Abs. in Phytopathology, 7 (1917), No. 1, p. 77*).—The occurrence of scars due to pycnia is said to offer a valuable diagnostic character for the identification of the white-pine blister rust.

"Black thread" disease of Hevea in Burma, J. F. DASTUR (*Dept. Agr. Burma Bul. 14 (1916), pp. 4, pl. 1*).—A brief account is given of the development and spread of the black thread disease of Hevea in Burma due to *Phytophthora* sp. The fungus remains dormant in the tissues during the monsoon after tapping is stopped, and resumes activity when tapping is resumed. The principal measures recommended as preventive are thinning out thickly planted areas, removal of diseased fruits, and suspension of tapping on trees showing black thread.

Phytophthora sp. on Hevea brasiliensis, J. F. DASTUR (*Mem. Dept. Agr. India, Bot. Ser., 8 (1916), No. 5, pp. 217–232, figs. 10*).—This is a more detailed account than that above noted of the Phytophthora disease of *H. brasiliensis*, which is thought to have been present in Burma since 1903, at least on Hevea trees.

The effects of the fungus attack on the tapping areas and in the epidermal cells of the fruit are described, as are also studies in the morphology and biology of the fungus. These are claimed to show that there may be two stem diseases present in *H. brasiliensis* due to different species of Phytophthora, one of these being *P. faberi*. In those parts of Burma where the rainfall is not excessive, the author found that suspension of tapping during the rainy season checked the disease.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

New mammals from North and Middle America, E. A. GOLDMAN (*Proc. Biol. Soc. Wash., 30 (1917), pp. 107–116*).—The San Miguel Island opossum (*Didelphis marsupialis particeps*) from San Miguel Island, Panama; savanna marmosa (*Marmosa mexicana savannarum*) from Panama; Bangs collared peccary (*Pecari angulatus bangsi*) from Panama; Pinacate desert mouse (*Peromyscus eremicus papagensis*) from Sonora, Mex.; Nevada bushy tailed wood rat (*Neotoma cinerea lucida*) from Nevada; Wyoming kangaroo rat (*Perodipus ordii luteolus*) from Wyoming; black naped agouti (*Dasyprocta punctata nuchalis*) from Panama; Richmond's agouti (*D. punctata richmondi*) from Nicaragua; Nelson's false vampire (*Vampyrus spectrum nelsoni*) from Vera Cruz, Mex.; and the northern yellow-shouldered bat (*Sturnira lilium parvidens*) from Papayo, Guerrero, Mexico, are described as new.

The conservation of our northern mammals, C. G. HEWITT (*Com. Conserv. Canada Rpt., 7 (1916), pp. 32–40, pls. 2*).—This paper deals particularly with the caribou, musk ox, etc., and means for their protection. Colored maps show the approximate distribution of the barren ground caribou (*Rangifer arcticus*) and musk ox (*Ovibos moschatus*) and related forms in Canada.

Control of the pocket gopher in California (*California Sta. Bul. 281 (1917), pp. 15, figs. 4*).—The first of the two parts of this bulletin (pp. 3–13), by J. Dixon, deals with the natural history of the pocket gopher and various

methods of control; the second part (pp. 14, 15), by E. R. de Ong, with a method of poisoning pocket gophers, which consists in the use of sweet potatoes, parsnips, or carrots, 8 qt.; flour paste, 0.5 pint; strychnin alkaloid, powdered, 0.25 oz.; and saccharin, 0.0625 oz.

Varying hares of the prairie Provinces, N. CRIDDLE (*Agr. Gaz. Canada, 4 (1917), No. 4, pp. 260–263*).—*Lepus americanus* and its various geographic races, with a range in western Canada almost as extensive as the woodlands, is a source of great injury to young trees through gnawing and eating the bark. The destruction of acres of aspen poplars in this way after a severe winter is said to be not an uncommon sight. Larches are also denuded of their bark, while spruce and pine are generally stripped of their branches. The greatest injury thus far recorded is said to have occurred during the winter of 1915–16. Enormous numbers of aspen poplars were destroyed in southern Manitoba and Saskatchewan and the infestation appears to have extended far northward. Practically all kinds of trees and shrubs were attacked, plum, cherry, and apple trees frequently being cut to the ground and in some instances quite old orchards were badly injured.

Their natural enemies are briefly considered, as are methods of protection by means of poultry netting, poisoning, and shooting.

On the ecology of the vegetation of Breckland, E. P. FARROW (*Jour. Ecology, 5 (1917), No. 1, pp. 1–18, pls. 6, fig. 1*).—This deals with the general effects of rabbits on the vegetation.

Description of a new race of Say's ground squirrel from Wyoming, A. H. HOWELL (*Proc. Biol. Soc. Wash., 30 (1917), pp. 105, 106*).—*Callospermophilus lateralis caryi* n. subsp. is described from Wyoming.

Two new pocket mice from Wyoming, E. A. GOLDMAN (*Proc. Biol. Soc. Wash., 30 (1917), pp. 147, 148*).

Mutanda ornithologica, I, II, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 30 (1917), pp. 75, 76, 125, 126*).

The birds of South America, LORD BRABOURNE and C. CHUBB (*London: R. H. Porter, 1912, vol. 1, pp. XIX+504, pl. 1*).—This first volume, which consists of a list of South American birds, terminates a proposed 16-volume work, owing to the death of Lord Brabourne at the front in 1915. It contains a systematic index, a classified and systematic list of 4,561 forms representing 874 genera, and an alphabetical index.

Illustrations to the birds of South America, H. GRÖNVOLD (*London: John Wheldon & Co., vol. 2, 1915, pt. 1, pls. 19; 1916, pts. 2, pls. 4; 3, pls. 4; 4, pls. 4; 5, pls. 4; 1917, pt. 6, pp. 11, pls. 3*).—These six parts consist of colored plates of the game birds and waterfowl of South America, originally intended to form part of 400 hand colored plates illustrating the above-mentioned work. Short descriptive notes by H. K. Swann on most of the species illustrated preface the same.

A new honey eater from the Marianne Islands, A. WETMORE (*Proc. Biol. Soc. Wash., 30 (1917), pp. 117, 118*).—*Myzomela rubratra saffordi* n. subsp. is described from the islands of Guam and Saipan.

A new shrew from Nova Scotia, H. H. T. JACKSON (*Proc. Biol. Soc. Wash., 30 (1917), pp. 149, 150*).—A new shrew is described under the name *Sorex fumeus umbrosus*.

Description of a new genus of Anatidæ, H. C. OBERHOLSER (*Proc. Biol. Soc. Wash., 30 (1917), pp. 119, 120*).—The genus Horizonetta is erected for the Laysan teal (*Anas laysanensis*).

Notes on rearing insects for experimental purposes and life history work, A. M. WILCOX (*Psyche, 24 (1917), No. 1, pp. 7–12, pls. 2*).

The growth of insect blood cells in vitro, R. W. GLASER (*Psyche, 24 (1917), No. 1, pp. 1–7, pl. 1*).—This is a report of observations on the morphology and behavior of growing insect blood cells, made during the course of a study of the pathological changes which take place in insect tissue, in which the tissue was cultivated in vitro.

Toxic values and killing efficiency of the arsenates, A. L. LOVETT and R. H. ROBINSON (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 4, pp. 199–207*).—This is a report of work carried on at the Oregon Experiment Station in continuation of that of Tartar and Wilson previously noted (E. S. R., 34, p. 548). The results afford further verification of the earlier work and give material data on (1) the comparative time and (2) the approximate amount of lead hydrogen arsenate and basic lead arsenate required to kill small caterpillars and nearly mature caterpillars; and (3) the proportion of these arsenates devoured by the small and mature caterpillars that passes through the alimentary canal of the larvæ. The work has been summarized by the author as follows:

"Lead hydrogen arsenate has a higher killing efficiency at a given dilution than either calcium or basic lead arsenate. It requires a longer period of time to kill the nearly mature caterpillars than the small forms. All of the arsenic devoured by the insects in feeding upon sprayed foliage is not assimilated, but a portion passes through the intestinal tract in the excrement. The percentage amount of the arsenic assimilated depends upon the arsenate used; lead hydrogen arsenate was assimilated readily and most of the arsenic was retained in the tissue, while much of the basic lead arsenate was found in the excrement. It requires approximately 0.1595 mg. of arsenic pentoxid to kill 1,000 small tent caterpillars and approximately 1.84 mg. of arsenic pentoxid to kill 1,000 nearly mature tent caterpillars, irrespective of the particular arsenate used as a spray.

"Preliminary experiments on the burning effects of calcium arsenate indicate too severe injury to warrant the practical use of this spray."

Winter cover washes, A. H. LEES (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 245–250*).—In continuation of work previously noted (E. S. R., 34, p. 253), it was found that the best cover wash consists of lime 30 lbs., glue 2 lbs., potassium dichromate ½ oz., and water 10 gal. "This lime-glue-dichromate mixture has been tried against ordinary lime wash at Long Ashton and has given decidedly superior results. An application to an apple tree stopped aphis hatching to such an extent that hardly an aphis was to be seen on it throughout the season though control trees were very badly attacked. The tree stood out all the season from its fellows by the healthy green uncurled leaves and at the end of the season by its very numerous well-developed fruit buds."

Accessory wetting substances with special reference to paraffin emulsions, A. H. LEES (*Ann. Appl. Biol., 3 (1917), No. 4, pp. 141–149, fig. 1*).—This discussion is accompanied by a table which gives the results of tests of the wetting power of paraffin emulsions and of other auxiliary wetting agents on certain natural surfaces.

The author concludes that there is no object in introducing greater quantities of paraffin or soap since a 2 per cent soap-paraffin emulsion (20 lbs. soap and 2 gal. of paraffin to 100 gal. water) gives perfect wetting. The work has shown that it is not possible to reduce the quantity of either the paraffin or soap without destroying the desirable qualities of the mixture, and that the above mentioned mixture is the cheapest that can be used which at the same time has the highest wetting power.

"The value of this 2 per cent emulsion lies not so much in its own killing power as in the fact that it can act as a carrier, so to speak, for other fungicidal or insecticidal bodies which, used alone, would prove themselves insufficient to

kill. Thus, liver of sulphur, used alone, has no great controlling effect on American gooseberry mildew but, combined with paraffin emulsion, has given promising results in a commercial scale experiment undertaken by Barker and myself. In the direction of insect control it also shows promise. While dilute solutions of nicotin are without decided action on adult caterpillars or difficultly killed beetles, such as *Byturus tomentosus*, the raspberry beetle, it has been found possible, at any rate on the small scale, to kill these by uniting the same nicotin solution with 2 per cent paraffin emulsion."

[Progress report of investigational work in entomology] (*Missouri Sta. Bul. 147 (1917), pp. 32–34*).—In dusting and spraying experiments on field corn for the control of the corn ear worm, by L. Haseman, six different treatments were applied on an area of 2 acres on creek bottom land, but the worms were so scarce that the results did not justify the expense of application. One plat dusted with 3 parts of arsenate of lead powder and 1 part of powdered sulphur showed a reduction in the infestation of 50 per cent, while another plat sprayed with a solution containing 1 tablespoonful of arsenate of lead powder to 1 gal. of water showed a reduction of 75 per cent, but on a plat of upland corn numerous treatments did not appear to check the pest in any degree.

Other work briefly reported upon includes investigations of the Hessian fly-resistant qualities of different varieties of wheat, by L. Haseman and C. G. Vinson, an account of which by Haseman has been previously noted (E. S. R., 35, p. 759); of insect pests of melon and related crops, by L. Haseman; of insects injurious to nursery stock, by L. Haseman, K. C. Sullivan, and A. H. Hollinger; and of the scale insects of Missouri, by A. H. Hollinger.

Report of the State entomologist on injurious insects and fungi of trees in 1914, T. H. Schöyen (*Indber. Norske Skogv., 1914, pp. 150–155, pl. 1*).—This report on the occurrence of important insect enemies and fungus diseases includes an account of the damage caused to trees by mice.

Preliminary account of entomological work in 1914, B. N. Zolotarevskii (*Predvaritel'nyi Otchet o Rabotakh po Entomologii v 1914. Stavropol: Selsk. Khoz. Opytn. Sta., 1915, pp. 12*).—This report deals with the occurrence of the more important insects of the year, particularly those attacking cereal crops.

Some East African insects of economic importance, R. H. Deakin (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 241–244*).—Brief notes based upon observations during a period of 18 months.

Insect enemies of man and the household and the diseases they convey, A. Berlese (*Insetti delle Case e dell' Uomo e Malattie che Diffondono. Milan: Ulrico Hoepli, 1917, pp. XII+293, figs. 100*).—A small handbook.

Household and camp insects, E. P. Felt (*N. Y. State Mus. Bul. 194 (1917), pp. 84, figs. 41*).—This is a summary of information on insects of the household and camp, particular attention being given to control measures.

Studies on Coccobacillus acridiorum and on certain intestinal organisms of locusts, E. M. DuPorte and J. Vanderleck (*Ann. Ent. Soc. Amer., 10 (1917), No. 1, pp. 47–62*).—Part 1 of this report of studies, made at McGill University, consists of experiments on the control of locusts by the use of *C. acridiorum*, and part 2 of descriptive studies on *C. acridiorum* and 16 related native organisms. The results indicate that the biological method for the control of the locust can not take the place of the measures now in use under the conditions which obtain in eastern Canada.

The pathogenicity of *C. acridiorum* was tested for all species of locusts and grasshoppers, seven in number, commonly occurring in large numbers in the region. *Gryllus pennsylvanicus*, one of the common field crickets, was also found to be susceptible to the disease. The yellow bear caterpillar [(*Spilosoma*) *Diacrisia virginica*] and the Colorado potato beetle, larvæ and adults

were also tested, and all individuals of the former were dead in less than 48 hours, but the latter was not susceptible to the disease.

The azalea lace bug, Stephanitis pyrioides, E. L. DICKERSON and H. B. WEISS (*Ent. News, 28 (1917), No. 3, pp. 101–105, pl. 1*).—A report of studies of the morphology and biology of this tingitid which has recently become abundant and widespread enough in New Jersey to do considerable damage to azaleas.

This species, which was originally described by Scott from Japan in 1874, is said to have been introduced into New Jersey in the egg stage on evergreen azaleas from that country. It is also known to occur at Bala, Pa., and Washington, D. C., and in Holland. The nymphs and adults feed on the undersurface of the leaves, abstracting the sap and causing a discoloration of the foliage on the upper surface. In severe infestations the leaves become almost white, many of them drying completely and dropping off. The underside of the leaves is disfigured by the insect's excrement.

In central and southern New Jersey, the egg, in which stage the winter is passed, hatches the latter part of May. The length of each of the five nymphal stages varies from three to six days. The appearance of the adults the latter part of June is closely followed by oviposition which lasts for a period of two weeks. These eggs require on an average two weeks for hatching. Growth is completed by the last week in July and the first week in August and many new adults are present. During the first two weeks of August eggs are again laid and by the middle of and last week in September many adults of this brood are present, the overwintering eggs being deposited at this time and during the first part of October. Thus there are three broods in southern New Jersey, the average length of each being about one month. In the central and northern parts of the State, however, there are only two and a partial third.

The lace bug on azaleas may be controlled by spraying with whale-oil soap at the rate of 5 or 6 lbs. to 50 gal. of water, preferably shortly after the overwintering eggs have hatched.

The Cicadellidæ of Wisconsin, with description of new species, J. G. SANDERS and D. M. DELONG (*Ann. Ent. Soc. Amer., 10 (1917), No. 1, pp. 79–97, figs. 49*).—The authors list 206 species and varieties representing 38 genera, of which 13 species are described as new.

Spraying for apple sucker (Psylla mali), F. R. PETHERBRIDGE (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 230–234*).—"These experiments indicate that lime and salt [lime 150 lbs., salt 30 lbs., and water 100 gal.] may be effective in preventing a large proportion of apple sucker eggs from hatching. Lime wash was also fairly effective. Soft soap and nicotin, or treacle and nicotin, were the most effective after the suckers had hatched. Spraying to prevent the eggs from hatching is not sufficient to keep this pest under control, but should be followed by an application of nicotin and soft soap, or treacle and nicotin, to kill those which have hatched."

Some observations on the egg of Psylla mali, A. H. LEES (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 251–257, figs. 9*).—A brief report of a morphological and embryological study.

Plant lice on potatoes, W. R. BROWN (*Rural New Yorker, 76 (1917), No. 4416, p. 1053, fig. 1*).—This records serious injury to the potato in Hampshire County, Mass., by the potato aphis during the summer of 1917.

An instance is cited of a promising 8-acre field which was killed by the plant lice before the tops were half grown. The first application of blackleaf 40 was inefficient due to too great a dilution. The second application killed the aphids, but the plants had been so weakened by the lice and the turning of the potato tops with a hand rake in order that the spray might hit the underside of the leaves that they died in a short time.

J. S. Regan, of the Massachusetts Agricultural College, who has conducted experiments, recommends the use of blackleaf 40, 1.25 teaspoonfuls, and 1 oz. of soap to a gallon of water, applied with an angle disk nozzle carried close to the ground so that it will direct the spray upwards and hit the underside of the leaves. Whale or fish-oil soap used at the rate of 1 lb. to 6 gal. of water is said to be nearly if not quite as good. Either of these insecticides properly applied was found to be from 98 to 99 per cent effective.

The louse and its relation to disease.—Its life history and habits and how to deal with it, B. F. CUMMINGS (*Brit. Museum (Nat. Hist.), Econ. Ser., No. 2 (1915), pp. 16, pl. 1, figs. 2*).—This is a popular account.

The rate of increase of the pink bollworm in green bolls in the period July to November, 1916, L. H. GOUGH (*Min. Agr. Egypt, Tech. and Sci. Serv. Bul. 13 (1917), pp. 20, pl. 1*).—The data here given are based upon 106,400 bolls examined.

While the highest percentage of bolls attacked was found the second week of October, the largest number of bolls attacked must have existed during the third week in September. "If the figures on which our calculations have been based are accepted as sufficiently accurate, it can be estimated that when at its maximum the Gelechia population reached at least 4,500 individuals per thousand cotton plants (500 holes). Supposing 26,000 plants to the feddan [1.04 acres], this gives the alarming total of about 120,000 worms to the feddan. . .

"Considering that Gelechia is an imported pest, which has been in Egypt less than ten years, its increase has been enormous. It now occurs, everywhere where cotton is grown in Egypt; in the last week of October, 87 per cent of the green bolls in Lower, 78 per cent in Middle, and 60 per cent in Upper Egypt were attacked by it; and we have received specimens of the adult from the desert at Romani."

On the rate of increase of Gelechia gossypiella larvæ in green bolls during 1916, L. [H.] GOUGH (*Bul. Soc. Ent. Egypte, 9 (1916), No. 4, pp. 113–115*).—Substantially noted above.

The pink bollworm, J. P. BUCHANAN (*Cong. Rec., 55 (1917), No. 126, pp. 7140–7143*).—An address in which attention is called to the danger of this important cotton pest becoming established in the United States.

What effect has flooding of a cotton field by infiltration from high Nile on the numbers of the pink bollworm in that field? (*Bul. Soc. Ent. Egypte, 9 (1916), No. 4, pp. 105–108*).—It is pointed out that since (*Gelechia*) *Pectinophora gossypiella* pupates to a very large extent on the ground amongst fallen leaves, etc., it is very probable that a heavy flooding lasting for weeks will cause the death of the pupæ and pupating larvæ. Since *Earias insulana* larvæ pupate to a much greater extent on the plants they are much less likely to be destroyed by flooding.

Sciara tritici, a fly injurious to seedlings, F. W. EDWARDS and C. B. WILLIAMS (*Ann. Appl. Biol., 2 (1916), No. 4, pp. 258–262*).—This dipteran is reported to be the source of injury to Primula seedlings.

The mosquitoes of North and Central America and the West Indies, L. O. HOWARD, H. G. DYAR, and F. KNAB (*Carnegie Inst. Washington Pub. 159, vol. 4 (1917), pp. 525–1064*).—This second part of the systematic description, the first part of which comprises volume 3 previously noted (E. S. R., 34, p. 453), completes the work. In these two volumes the authors recognize 380 species (besides two which are synonyms, as pointed out in the appendix) included in 25 genera occurring within the North American Continent from the southern edge of Canada to the Isthmus of Panama, including the Antilles and Trinidad. Adding to these the species previously mentioned as not included and the one

described since the appearance of volume 3, there is a total of 398 described species from the region included in this work.

In the tribe Sabethini (pp. 19–187 of vol. 3) 8 genera and 85 species are recognized, including Sabethes, represented by 3 species; Sabethinus, 2 species; Peytonulus, 1 species; Limatus, 3 species; Wyeomyia, 65 species (4 new to science); Prosopolepis, 1 species; Lesticocampa, 5 species (2 new); and Joblotia, 3 species. In the tribe Culicini (pp. 189–523 of vol. 3 and pp. 525–1038 of vol. 4) 17 genera and 297 species are treated, including Dinocerites, represented by 1 species; Deinocerites, 5 species; Dinamanesus, 1 species; Culex, 104 species (6 new); Carrollia, 2 species; Lutzia, 2 species (1 new); Culiseta, 6 species; Mansonia, 7 species; Psorophora, 29 species; Aedes, 83 species (5 new); Haemagogus, 4 species; Orthopodomyia, 5 species; Aedeomyia, 1 species; Uranotænia, 11 species (1 new); Megarhinus, 11 species; Anopheles, 21 species (1 new); and Cœlodiazesis, 1 species.

Under each species are given the synonymy with references to the literature; copies of the original description and the original descriptions of the synonyms; detailed descriptions of the male, female, and larva, when known; distribution, including a full citation of localities, date, and collector; and what is known of the life history and habits.

It is pointed out that only a few parts of the region have been at all adequately explored, many large areas not at all, so that many more species doubtless wait discovery. A large proportion of the material studied consists of bred specimens with larvæ associated. Sixteen pages are devoted to the yellow-fever mosquito, for which the name *Aedes calopus* is used, though, as shown in a foot-note, the strict application of the rule of priority will necessitate the use of the name *A. argenteus* (Poiret).

Errors noted in the preceding volumes are corrected in an appendix (pp. 1039–1042) to which are added a few supplementary notes.

The relation between the hatching of the eggs and the development of the larvæ of Stegomyia fasciata (Aedes calopus) and the presence of bacteria and yeasts, E. E. Atkin and A. Bacot (*Parasitology, 9 (1917), No. 4, pp. 482–*[illegible].—The authors find that the larvæ of *S. fasciata* greedily consume both bacteria and yeasts, on which they can thrive in the absence of any other food, whereas in very many instances they fail entirely to develop on a variety of nutritive fluids and particles, including dead bacteria, under sterile conditions. The rearing of adults under sterile conditions is so exceptional that they feel justified in concluding that the presence of bacteria or yeast is a practical necessity for the maintaining of the species.

On the biology and economic significance of Tipula paludosa, J. Rennie (*Trans. Appl. Biol., 2 (1916), No. 4, pp. 235–240, pl. 1; 3 (1917), No. 2–3, pp. 116–137, pls. 3, figs. 3*).—The first part of this paper consists of a preliminary report of observations; the second part deals with hatching, growth, and habits of the larva.

Notes on New England Tachinidæ, with the description of one new genus and two new species, H. E. Smith (*Psyche, 24 (1917), No. 2, pp. 54–58*).—*Pseudotachinomyia wcbberi* n. g. and n. sp. and *Sciasma frontalis* n. sp. from Massachusetts are described.

The larvæ of *Pelatachina pellucida*, which emerged from the larvæ of *Euvanessa antiopa* during August, hibernated in the puparia. From 344 of the lepidopterous larvæ 214 puparia were obtained, but since superparasitism existed to a great extent in the host larvæ, the figures do not indicate the exact percentage of parasitism. This is thought to be the first record of a species of the genus having been reared in North America, although the rearing of the genotype, *P. nibialis* from *Vanessa urticæ* in Europe has been recorded.

Compsilura concinnata, a European species introduced into and established in this country as one of the foremost primary parasites of the gipsy and brown-tail moths, is known to have been reared from more than 20 species of native North American Lepidoptera. It is said to be particularly prolific as a parasite of *E. antiopa*, in certain instances the percentage of parasitism of this host in the New England States being well over 50. The data at hand appear to establish the fact that it hibernates through the winter in New England in the pupa of *E. antiopa*.

The collection of *Exoristoides slossonæ* at Bennington, Vt., is recorded and *Exorista spinipennis* is said to be a synonym of *E. slossonæ*.

Seasonal abundance of flies in Montana, R. R. PARKER (*Ent. News*, 28 (*1917*), *No. 6, pp. 278–282, pl. 1*).—This is a report of the seasonal abundance of flies, especially the house fly, based upon work done at Laurel, Mont., during July and August, 1914.

Empusa muscæ versus Musca domestica, H. T. GÜSSOW (*Ann. Appl. Biol.*, *3* (*1917*), *No. 4, pp. 150–158, pl. 1*).—In discussing the subject the author reviews the work of Hesse, previously referred to (E. S. R., 34, p. 254), and records cultural experiments and other observations on *E. muscæ*.

Report on a trial of tarred felt disks for protecting cabbages and cauliflowers from attacks of the cabbage root fly, J. T. WADSWORTH (*Ann. Appl. Biol.*, *3* (*1917*), *No. 2–3, pp. 82–92, pl. 1*).—A detailed report of experiments with cabbage and cauliflower, conducted at Manchester University, which show tarred felt disks to be a very effective means of protection. A list of 15 references to literature on the subject is appended.

Two new cambium miners, C. T. GREENE (*U. S. Dept. Agr., Jour. Agr. Research*, *10* (*1917*), *No. 6, pp. 315–318, pl. 1*).—The author describes two new species of Agromyza, the larvæ of which mine in the cambium of the living tree, causing a scar which is known as "pith-ray fleck." The mines somewhat resemble those of the cambium miner (*Agromyza pruinosa*) in river birch (*Betula nigra*), an account of which has previously been noted (E. S. R., 30, p. 855).

The species first described is *Agromyza aceris*, which mines down the cambium in the trunk and roots of the red maple (*Acer rubrum*), occurring quite commonly at Falls Church, Va., and French Creek, W. Va. The second species described as *A. amelanchieris*, was taken from the trunk near the ground and from the roots of the service berry or shadbush (*Amelanchier canadensis*) at French Creek, W. Va.

Investigations of the Anthomyidæ, the larvæ of which are carnivorous, D. KEILIN (*Parasitology*, *9* (*1917*), *No. 3, pp. 325–458, pls. 11, figs. 41*).—The species considered include *Melanochelia riparia*, *Graphomyia maculata*, *Allognota agromyzina*, *Phaonia* spp., *Myospila meditabunda*, *Mydæa* spp., *Hydrotæa* spp., *Muscina* spp., etc.

New genera and species of American muscoid Diptera, C. H. T. TOWNSEND (*Proc. Biol. Soc. Wash.*, *30* (*1917*), *pp. 43–50*).—Thirteen genera and four species are here described as new.

The viability of Melophagus ovinus, the sheep louse fly, sheep ked, or sheep "tick," GEORGINA SWEET and H. R. SEDDON (*Vet. Jour.*, *73* (*1917*), *No. 502, pp. 6–14*).—The authors' experiments show that the life of the sheep tick in shed wool is short under uniform temperature, whether cool or moderate. The state of nutrition does not seem to influence the viability of these ticks.

Fleas as a menace to man and domestic animals.—Their life history, habits, and control, J. WATERSTON (*Brit. Museum (Nat. Hist.), Econ. Ser.*, *No. 3* (*1916*), *pp. 21, pl. 1, figs. 6*).—A popular account.

Observations on the larval and pupal stages of Agriotes obscurus, G. H. Fox (*Ann. Appl. Biol., 3 (1917), No. 2–3, pp. 97–115, pls. 2, fig. 1*).—This is a report of studies of the immature stages of the common wireworm in Cheshire, North Staffordshire, and South Lancashire.

The life of the larva has been found to be probably four rather than five years. "The larva pupates in an earthen cell in the ground, down to 1 ft. deep; the pupal period is about three weeks; the imago remains resting motionless in the pupal cell for roughly two months, after which it comes to the surface, and hibernates under stones, clods, etc., until the next season."

A bibliography of 20 titles is appended.

Note on attacks of Phyllotreta vittula on spring corn, F. R. PETHERBRIDGE (*Ann. Appl. Biol., 3 (1917), No. 2–3, pp. 138, 139*).—The author records the injury caused by this beetle to young barley plants at Warminster and Rothamsted, England.

A flea-beetle which attacks potato plantations on the plateaus, M. T. DAWE (*Rev. Agr. [Colombia], 2 (1916), No. 8, pp. 458–461; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, pp. 133, 134*). *Epitrix nigroaenea*, which closely resembles *E. cucumeris*, is said to attack the young, tender leaves of potatoes as soon as they appear and sometimes ruins an entire plantation in Colombia.

The bark borer (Dendroctonus micans), I. TRÄGÅRDH (*Skogsvårdsför. Tidskr., 14 (1916), No. 5, pp. 484–486, figs. 3*).—This borer, the largest of the European species, destroys an enormous number of both pine and fir trees each year, particularly those which have attained a growth of 25 to 50 years. The paper includes notes on its life history and habits, but no mention is made of control measures.

On new neotropical Curculionidæ, G. A. K. MARSHALL (*Ann. and Mag. Nat. Hist., 8. ser., 18 (1916), No. 108, pp. 449–469; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, p. 124*).—One genus, 17 species, and one subspecies, largely from the West Indies and South America, are described as new. The paper includes descriptions of one species and one subspecies of Diaprepes new to science and a review of the paper by Pierce on the genus Diaprepes previously noted (E. S. R., 33, p. 360).

The fauna of British India, including Ceylon and Burma.—Coleoptera. Rhynchophora: Curculionidæ, G. A. K. MARSHALL (*London: Taylor & Francis, 1916, pt. 1, pp. XV+367, figs. 108; rev. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, p. 125*).—This volume contains an introductory account of the Curculionidæ in its wide sense, Lacordaire's system of classification being adopted. Two subfamilies, the Brachyderinæ and Otiorrhynchinæ, comprising 342 species, are dealt with in detail. Fifteen genera are erected and 179 species are described as new.

The fauna of British India, including Ceylon and Burma.—Hymenoptera: Ichneumonidæ, I, C. MORLEY (*London: Taylor & Francis, 1913, vol. 3, pp. XXVI+531, pl. 1, figs. 152*).—This first part of volume 3 of the work previously noted (E. S. R., 15, p. 280), dealing with the subfamily Ichneumones Genuini, first gives a bibliography of the literature consulted. This is followed by a summary of the known Indian forms, consisting of 406 species representing 140 genera; an index to the Indian hosts; a glossary of terms employed in the work; and a systematic index. In the introduction to the main part which follows, the author discusses the history of the group, metamorphoses, internal and external structure, and classification.

Twelve genera, 99 species, and 3 varieties are described as new.

Guide to the insects of Connecticut.—III, The Hymenoptera, or wasp-like insects of Connecticut, H. L. VIERECK ET AL. (*Conn. State Geol. and Nat. Hist. Survey Bul. 22 (1916), pp. 824, pls. 10, figs. 15*).—This third part of the work

previously noted (E. S. R., 26, p. 147) deals with the Hymenoptera, and gives tables for the separation of the families, genera, and species of forms known to occur in Connecticut, together with brief descriptions and records of the distribution of such forms in the State. In collaboration with the author, A. D. McGillivray has prepared the part relating to the superfamily Tenthredinoidea; W. M. Wheeler that relating to the superfamily Formicoidea; C. T. Brues that of superfamily Serpholdea or Proctotrypoidea, and families Cosilidæ and Bethylidæ of the superfamily Vespoidea; and S. A. Rohwer, the superfamilies Sphecoidea and Vespoidea, with the exception of certain groups. The work records 86 families represented by 634 genera and 1,102 species from Connecticut, of which 366 species were originally described from the State. Complete indexes to the plant hosts, insect hosts, and Hymenoptera are included.

Observations on the occurrence of the Argentine ant (Iridomyrmex humilis) in Silesia, F. PAX (*Illus. Schles. Monatschr. Obst, Gemüse u. Gartenbau, 4 (1915), No. 3, p. 33; abs. in Rev. Appl. Ent., Ser. A, 5 (1917), No. 3, pp. 97, 98*).—The Argentine ant, which is known to occur in the open in Portugal, Bosnia, and Belgium, is reported to have been found in the greenhouse of the Botanic Gardens at Breslau.

On some North American species of Microdon, F. KNAB (*Proc. Biol. Soc. Wash., 30 (1917), pp. 133-144*).—Five new syrphid species are here described.

New chalcid flies from Maryland, II, A. A. GIRAULT (*Ent. News, 28 (1917), No. 6, pp. 255-258*).—In continuation of the paper previously noted (E. S. R., 36, p. 556) four species and one genus, Blattotetrastichus, are described as new.

A new aphis-feeding Aphelinus, L. O. HOWARD (*Proc. Biol. Soc. Wash., 30 (1917), pp. 77, 78*).—*Aphelinus lapisligni* reared from *Aphis bakeri* at Forest Grove, Oreg., is here described as new.

The cyclamen mite, W. A. ROSS (*Agr. Gaz. Canada, 4 (1917), No. 5, pp. 174, 175, fig. 1*).—An undescribed species of Tarsonemus was reported by florists in Hamilton, Brantford, and Niagara Falls in the fall of 1916 as destroying the flowers and flower buds of cyclamen and causing the foliage to curl, resulting in the affected plants being rendered absolutely worthless.

ANIMAL PRODUCTION.

Physiological effect on growth and reproduction of rations balanced from restricted sources, E. B. HART, E. V. MCCOLLUM, H. STEENBOCK, and G. C. HUMPHREY (*U. S. Dept. Agr., Jour. Agr. Research, 10 (1917), No. 4, pp. 175-198, pls. 15*).—In this contribution from the Wisconsin Experiment Station, work previously noted (E. S. R., 26, p. 467) is continued.

The experiment was carried out with grade Holstein heifers weighing from 200 to 400 lbs. The feeding period began in 1910 and continued for two years. It was proposed that one group should receive its nutrients wholly from the corn plant, another from the wheat plant, a third from corn grain and wheat straw, a fourth from wheat grain and corn stover, and a fifth from corn grain and the roughage equally divided between alfalfa hay and wheat straw. In carrying out the work other factors, as the baking of the wheat, the addition of certain mineral elements, etc., were introduced in an attempt to obviate the difficulties encountered.

A physiologically complete ration of corn-grain and corn-stover was not disturbed by altering the calcium-magnesium ratio through the addition of magnesium salts nor by the addition of mineral acids in excess.

A ration from the wheat plant alone did not sustain growth and the animals could not be bred. Blindness ensued, with feeble and emaciated condition and excitability, followed by collapse. The addition of salt did not improve the

ration nor did the baking of the wheat. Additions of butter fat did not uniformly improve the ration. The causes are ascribed to an inherent toxicity of the wheat grains especially resident in the embryo. The addition of a large amount of wheat embryo was found likely to produce an early abortion. From a histological examination of the organs of the animals fed wheat products some attention is called to the similarity with conditions in beriberi in man. These animals also showed a low resistance to other diseases, notably anthrax.

Corn grain with wheat straw sustained growth at a slow rate. The offspring, however, were born weak or dead. The addition of salt to this ration made it normal, indicating that it was the needed factor lacking.

With wheat grain and corn stover growth was made but reproduction was only partially sustained, depending apparently on individuality. Where reproduction was successful in the first period, it failed in the second, due to the cumulative effects of the toxins of the wheat.

In the case of corn grain and a roughage made up of one-half each of wheat straw and alfalfa hay excellent growth was maintained and normal reproduction in the first period. In the second gestation period, however, weakness appeared. While this mixture made an improved ration, it was not perfect and might fail through accumulated toxicity.

The experiments indicate that modifications must be made of our present ideas of "balanced" rations and that we must take into consideration other factors as toxicity, a proper balance of salts, and certain growth-promoting compounds of unknown nature.

Some nutritional characteristics of corn, J. T. WILLARD (*Kans. Acad. Sci. Bul. 1 (1916), pp. 16*).—A paper read at the annual meeting, in which a number of tables of analyses from various sources are shown and data compiled. A popular discussion is given of the corn plant as a factor in nutrition, and various experiments, including recent ones at the Kansas Experiment Station, are quoted.

Feeds and feeding abridged, W. A. HENRY and F. B. MORRISON (*Madison, Wis.: Henry-Morrison Co., 1917, pp. VIII+440, figs. 116*).—A condensed edition of the sixteenth edition of Feeds and Feeding (E. S. R., 34, p. 261), to which have been added chapters on the feeding and care of poultry. An appendix contains tables showing the composition, digestible nutrients, and fertilizing constituents of the more important feeds. Each chapter closes with questions covering the subjects noted, and it is sought throughout to adapt the book to the needs of agricultural courses in secondary schools and short courses in agricultural colleges.

Cost of digestible nutrients in principal cattle feeds, H. B. WINTERS (*N. Y. Dept. Agr. Bul. 84 (1916), pp. 2147–2164*).—The value of available cattle feeds from June 1, 1915, to May 1, 1916, based upon the digestible nutrients, has been computed.

Commercial feeding stuffs, P. H. WESSELS ET AL. (*Rhode Island Sta. Insp. Bul. 1917, May, pp. 3–16*).—Analyses are reported of various brands of commercial feeding stuffs found for sale in Rhode Island in 1916, including meat scrap, fish scrap, tankage, cottonseed meal, linseed meal, gluten meal, gluten feed, distillers' dried grains, brewers' dried grains, wheat middlings, wheat bran, hominy feed, mixed and proprietary live stock and poultry feeds, ground oats, alfalfa meal, dried beet pulp, flax shives, and alfalfa.

Digest and copy of revised feeding-stuffs law (*New Jersey Stas. Circ. 74 (1917), pp. 2–8*).—A revision of Circular 10 (E. S. R., 28, p. 364), including the text of the law as amended March 16, 1916.

[Live-stock investigations], A. C. HARTENBOWER, J. BARBOUR, and L. B. BARR (*Guam Sta. Rpt. 1916, pp. 39–44, 50–53, 54–57, pls. 4, figs. 5*).—An effort was

made during the year to improve the live stock of the island by the further importation of pure-bred sires. New methods of feeding were also taken up, and all animals of the station were put upon definite rations.

The work with horses sought to improve the native stock by crossing with Morgan sires. The average weight of native horses is 460 lbs. They are hardier under local conditions, however, than imported animals. By crossing the size has been increased, and the crosses developed appear hardy on native pastures without extra feed. Native pasturage alone will not support Morgan horses. In a feeding experiment with two Morgan horses comparing alfalfa hay with Para grass, the former possessed a superior feeding value, although it can not be fed in Guam in the quantity and as successfully as in colder climates. For the station horses 5 lbs. of alfalfa hay and 40 lbs. of Para grass per day gave good results.

Native bulls average 690 lbs. and cows 512 lbs. The crossbred cattle compare favorably in hardiness with the native cattle, and the improvement by crossbreeding is most satisfactory.

During the year two Berkshire boars were imported. The stock in hand had deteriorated through inbreeding and parasitic infestation. A feeding experiment was carried out with two lots of four pigs each, comparing a ration of breadfruit and coconuts with corn and shorts. The animals were fed for 140 days. The pigs on the breadfruit-coconut ration made an average daily gain per head of 0.388 lb. at a cost of 11.58 cts. per pound. Those on the corn and shorts ration made an average daily gain of 0.45 lb. at a cost per pound of gain of 11.09 cts. Attention is called to the high cost of gain and the necessity of forage crops to lessen the cost. For pasturage Para grass was found to be very satisfactory for hogs, and with a light supplementary ration of breadfruit and coconuts the animals remained in excellent condition.

The work with goats during the year was much hampered by parasites.

The crossbreeding of poultry is showing good results. The best record of six native hens was 42 eggs per year, while that of six hens of the Brown Leghorn-native cross was 127 eggs. In feeding rice hulls to young chicks, death from crop impaction resulted in some cases, and it was found advantageous to use unhulled light rice instead. In a comparative test of brooders, it was demonstrated that for the first six weeks after hatching the chicks should be kept off the ground. An experiment was made comparing an imported grain ration made up of wheat, corn, and oats (2:1:1) with a Guam-grown ration made up of rough rice, a dry mash being used in each case. Two lots of 12 each of Brown Leghorns and two lots of crossbred fowls were employed. The experiment ran from September 1 to June 30. The Brown Leghorns on imported feeds laid 719 eggs, on native feeds 842. The crossbred fowls on imported feed laid 714 eggs and on native feed 915 eggs. In feeding grated coconut to chicks under 6 weeks old, the inclusion of more than 5 per cent in the ration invariably produced diarrhea, while 15 per cent or more caused a total loss of all chicks.

[Animal husbandry studies at the Missouri Experiment Station] (*Missouri Sta. Bul. 147 (1917), pp. 21–27, 48*).—This progress report includes, among others, the following studies:

The use of nitrogenous concentrates and heavy and light rations of silage for fattening two-year-old steers, by H. O. Allison.—The test indicates that the cost of fattening cattle can be greatly reduced by the extensive use of corn silage with nitrogenous concentrates.

The value of sour milk and beef scrap in rations for growing chicks, and the cost of growing chicks, by H. L. Kempster.—At the end of the first three weeks 100 chicks with skim milk in the ration weighed 21.4 lbs. at a cost of 2.76 lbs. of feed per pound of gain, the beef scrap chicks weighed 15.1 lbs. at a cost of

5.54 lbs. of feed per pound of gain, and the no-milk-or-meat chicks weighed 9.86 lbs. at a cost of 15.1 lbs. of feed per pound of gain. The mortality in the three lots was 13.4, 22, and 34 per cent, respectively.

Live stock of the farm.—V, Pigs and poultry, edited by C. B. JONES (*London: The Gresham Publishing Co., 1916, vol. 5, pp. XI+269, pls. 41, figs. 17*).—This treats of pigs and poultry, as to breeds, feeds, management, marketing, and diseases.

Live stock of the farm.—VI, Bees, goats, dogs, ferrets, asses, and mules, edited by C. B. JONES (*London: The Gresham Publishing Co., 1916, vol. 6, pp. VIII+199, pls. 19, figs. 13*).—The treatment is similar to the part noted above.

[Swiss live stock industry], A. BORGEAUD, J. FREY, and D. BOURET (*Vie Agr. et Rurale, 6 (1916), No. 36, pp. 164–180, figs. 12*).—In this special number, devoted to Swiss agriculture, pages 164–175 treat of the cattle industry, breeds of cattle, and cooperation among cattle raisers; pages 176–180, of goats (breeds and breeding).

Statistics of Swiss live stock industry (*Ergeb. Schweiz. Viehzähl, Kanton Zürich, 1916, pp. 31, figs. 2*).—Data covering several years are presented as to the number and kinds of animals owned in the various cantons. From 1911 to 1916 there was practically no change in the number of horses. Cattle increased 1 per cent, and smaller animals over 9 per cent.

Proceedings of the nineteenth and twentieth annual conventions of the American National Live Stock Association (*Proc. Amer. Nat. Live Stock Assoc., 19 (1916), pp. 171, pls. 14; 20 (1917), pp. 202, pls. 14*).—The proceedings and addresses are reported of these conventions, held respectively, at El Paso, Tex., in January, 1916, and Cheyenne, Wyo., in January, 1917.

Inbreeding, A. B. BRUCE (*Jour. Genetics, 6 (1917), No. 3, pp. 195–200*).—On the assumption that inbreeding is essentially "self-fertilization" in a greater or lesser degree, and that, in each generation, selfing and mating at random take place in a fixed ratio, the author proposes general formulas to express not only the array but also the genetic constitution of the individuals of which the family under investigation is composed.

Report on cattle feeding experiments conducted at the schools of agriculture and experiment stations at Cedara, Natal, and Potchefstroom, Transvaal (*Union So. Africa Dept. Agr. [Pub.] 15 (1916), pp. 49, figs. 22*).—The experiments reported were made on from 10 to 16 head of three types of cattle to determine whether a profit could be obtained by using feeds produced on the farm. The feeds covered a wide range of roughage, maize meal, and peanut cake.

With 2-year-old cattle, profits were made by grass fattening, but the addition of maize meal resulted only in a reduction in profits.

The results with 3-year-old cattle indicated that their raising and fattening with local feeds appears to be a remunerative business. It is believed that the future of the beef cattle industry in South Africa will be the fattening of younger cattle of this class.

In experiments with superannuated work oxen with feeds easily produced on South African farms, profits were returned at present prices. Because of the scarcity at present in the London market there was a profit in such cattle where extra feeding had produced a covering of fat. In fattening the old oxen better gains were obtained with animals possessing a dash of improved blood.

Feeding experiment with oil-extracted palm kernel meal and undecorticated earthnut cake, J. HENDRICK and W. J. PROFFIT (*North of Scot. Col. Agr. Bul. 21 (1916), pp. 19*).—In continuation of work previously reported (E. S. R., 34, p. 586), an experiment was carried out to compare the value of oil-extracted palm kernel meal and undecorticated peanut cake with linseed cake, and also

to determine whether a home-grown product, crushed oats, could be profitably substituted for these imported feeds. The meal used was extracted with chemical solvents and contained less oil than the cake which was extracted under pressure.

Thirty-two crossbred bullocks in lots of 8 each were fed for 84 days, divided into periods of 28 days each. Turnips and straw were used as roughage. In addition, lot 1 received linseed cake and crushed oats; lot 2 peanut cake and crushed oats; lot 3 palm kernel meal, crushed oats, and a small portion of linseed meal to induce the animals to eat the ration; and lot 4 crushed oats. The manurial value was deducted from the cost of the feed in each lot. On linseed cake bullocks made an average gain of 2.31 lbs. daily, on peanut cake 1.90 lbs., on palm kernel meal 2.15 lbs., and on oats alone 1.98 lbs. The net cost of gain per hundredweight was for lot 1, 48s. ($11.66); lot 2, 46s. 3d.; lot 3, 51s.; and lot 4, 50s.

Peanut cake gave the best monetary returns and was eaten readily. Crushed oats alone, while costing more than the other feeds, was considered a satisfactory concentrate with turnips and straw.

Ageing Egyptian cattle, MOHAMMED ASKAR (*Agr. Jour. Egypt, 6 (1916), pp. 73–78, pls. 12*).—A discussion of methods of determining the age, with 17 drawings of the teeth and mouth, of Egyptian cattle.

Live stock of the farm.—IV, Sheep, edited by C. B. JONES (*London: The Gresham Publishing Co., 1915, vol. 4, pp. X+252, pls. 38, figs. 18*).—Chapter 1 deals with sheep farming in the British Isles, the development and distribution of breeds, and statistics. Chapter 2, prepared by various authors, gives a description of the different breeds. Chapters 3, 4, and 5 are devoted respectively to profitable sheep farming, general management and feeding, and diseases.

Sheep production, P. V. GARCÍA (*Bol. Min. Agr. [Argentina], 20 (1916), No. 5–6, pp. 391–462, figs. 32*).—A statistical discussion of the production and exportation of sheep from Argentina from 1895 to 1915.

The number of sheep in the country has greatly decreased in this period, especially among the lower grades. The quality of the animals has improved, however, both as to wool and meat. The average weight of carcasses exported from 1896 to 1915 shows a gradual increase from about 23 to above 27 kg. (50.6 to 59.4 lbs.).

Sheep and wool for farmers. Crossbreeding experiments, J. W. MATHEWS (*Agr. Gaz. N. S. Wales, 27 (1916), Nos. 5, pp. 325–334, figs. 6; 6, pp. 397–407, fig. 1*).—This experiment, which is being continued, compares the crossing of wool and mutton type sheep. The work reported, covering five years, gives the results in crossing Lincoln, Leicester, and Border-Leicester rams with Merino ewes. The number of ewes employed was 218.

Exclusive of lambs, the average body weights of the three crosses for all ages were as follows: Lincoln-Merino 107 lbs. 11½ oz., Leicester-Merino 107 lbs. 6½ oz., Border Leicester-Merino 117 lbs. 2 oz. In wool weight, the Lincoln cross wethers average 1 lb. 4 oz. over the Leicester cross and practically 1 lb. over the Border-Leicester cross. With the ewes the differences were 1 lb. 1 oz. and 10 oz., respectively, in favor of the Lincoln.

The wool averaged in price for the whole period as follows: Lincoln-Merino 13.19d. (26.2 cts.) per pound, Leicester-Merino 13.71d., and Border Leicester-Merino 13.89d.

Horses, R. POCOCK (*London: John Murray, 1917, pp. X+252*).—The origin, history, and future of the horse are treated by a practical man who has gleaned his knowledge from the western plains and in war.

Horse breeding and horse racing, J. C. EWART (*Nature [London]*, *99 (1917)*, *No. 2487, pp. 346, 347*).—The author points out the necessity for the preservation of the Thoroughbred horse and for the improvement of the breed for military and other purposes. As race horse breeding implies racing, the plea is made for the continuance of such racing as may be required to test the value of stallions and mares now at stud in the United Kingdom.

A history of the Percheron horse, compiled by A. H. SANDERS and W. DINSMORE (*Chicago: Sanders Publishing Co., 1917, pp. 602, pls. 131, figs. 10*).—In this history of the origin, evolution, development, and distribution of the modern draft type of Percheron horses the effort has been made to throw new light upon the foundation history of the type in the district of the Perche in France. Data for this part of the work were obtained from books, records, and documents in the Government archives at Paris, including the official registration and inspection entries of stallions bought for the French Government stud at Le Pin, and lists of stallions approved and subsidized by the Government prior to the Stud Book in the Perche. The evidence thus obtained seems to show that the Percheron horse has existed as a distinct type from very ancient times, and that Arabian blood has played very little part in the production of the latter-day type of the breed.

A detailed account is given of the introduction and dissemination of the breed throughout the United States, to which is appended a symposium recording the views of contemporary importers and breeders on the selection, feeding and general management of stallions, brood mares, and foals.

The diastatic action of saliva in the horse, R. J. SEYMOUR (*Amer. Jour. Physiol., 43 (1917), No. 4, pp. 577–585*).—Both the mixed and the isolated secretions of the parotid and submaxillary glands of the horse were found to contain diastase capable of converting starch into sugar. The diastase is inactive as being extremely feeble, requiring at least five hours for the conversion of boiled starch. The action of the diastase (ptyalin?) was not increased by filtration, by acidifying, or by exposing to the action of weak alkalies.

The saliva of the horse was found to be inactive on cellulose and on sucrose. The existence of the secretion of a zymogen with a subsequent conversion into active ptyalin was observed. "Salivary secretion may occur in the horse without mastication by stimulation with chemical substances, with an apparent augmentation through the psychic effect of the sight of food; the greatest flow occurs when the horse is permitted to masticate food material." Potassium sulphocyanid was not found in the saliva.

See also previous notes by Palmer (E. S. R., 36, p. 82) and by Palmer and Kleiber (E. S. R., 37, p. 681).

Sex-linked inheritance of spangling in poultry, G. LEFEVRE (*Abs. in Amer. Nat., 51 (1917), No. 606, pp. 499, 500*).—A series of experiments has been carried on at the Missouri Station for the purpose of determining the mode of inheritance of spangling in poultry (E. S. R., 35, p. 867).

The initial crosses were made reciprocally between Silver Spangled Hamburgs and Brown Leghorns, and the material used for the analysis has been obtained from twelve different matings. The conclusion has been reached that spangling is determined in inheritance by a distinct factor which behaves in a typically sex-linked fashion, the cocks being homozygous and the hens heterozygous for it in Silver Spangled Hamburgs. When spangling is introduced through the male, both sexes in the F_1 generation show spangles, while the reciprocal cross gives only spangled males, the females being nonspangled and incapable of transmitting the pattern.

It has been further shown that the expression of spangling may be greatly modified, or even entirely obscured, by the action of other factors, especially factors for black pigmentation, which, however, segregate independently of the factor for spangling. The independence of the spangling factor is indicated by the fact that, after segregation and recombination of the several factors concerned, some individuals are extracted in which all disturbing factors are absent and the spangled pattern is exhibited in its original purity. A number of such birds have been obtained from different matings, and these now breed as true to spangling as do the Silver Spangled Hamburgs themselves.

Mendelian inheritance in poultry, G. LEFEVRE (*Abs. in Missouri Sta. Bul. 147 (1917), pp. 47, 48*).—This is another abstract of the data reported above.

The structure of the fowl, O. C. BRADLEY (*London: A. & C. Black, Ltd., 1917, pp. XII+153, pls. 17, figs. 28*).—A concise descriptive anatomy of the fowl with a chapter on the embryology of the chick.

Studies on the physiology of reproduction in birds, I–VII, O. RIDDLE ET AL. (*Amer. Jour. Physiol., 41 (1916), No. 3, pp. 387–437; 42 (1916), No. 1, pp. 131–162*).—In this series of articles, the first seven of which are here noted, results are given of studies of the physiology of avian reproduction in relation to the problem of heredity and sex.

I. *The occurrence and measurement of a sudden change in the rate of growth of avian ova*, O. Riddle.—Continuing studies already noted (E. S. R., 26, p. 164) it has been shown that when the oöcyte of the fowl reaches a diameter of about 6 mm. it increases its previous rate of growth to a rate nearly 25.8 times higher. The transition from the one rate to the other is made in a single day and sharply marks off the type of substance accumulated in the ovum. Under the slower rate this is white yolk. Under the greatly increased rate the yellow yolk is produced. The increased rate of deposition of yolk materials is accompanied by a pronounced alteration in the growth and activity of the membrane (follicle) which surrounds the ovum. A comparable change in growth rate occurs generally in other avian and sauropsidan eggs.

II. *On the chemical composition of white and yellow egg yolk of the fowl and pigeon*, Adelaide A. Spohn and O. Riddle.—By taking advantage of the fact that the ova of the fowl consist wholly of white yolk until they begin the final period of rapid development (see above) the authors were able to procure samples of the two kinds of yolks for analysis. The results of the analyses of two samples of white yolk and of six samples of yellow yolk of the common fowl demonstrate that the two forms of yolk are strikingly different substances and that the white yolk much the more nearly approximates the composition of small holoblastic eggs, and of living undifferentiated tissue generally. The ovarian egg (yellow yolk) of the fowl contains little more than 45 per cent of water. The solids of the fowl's egg contain 20.6 per cent of phosphatids, 49.7 per cent neutral fat, and 28.4 per cent protein.

Analyses were also made of two samples of yellow yolk of the jungle fowl and five samples of yellow yolk of the common pigeon. The results indicate that the yellow yolk of the jungle fowl has probably a lower lipoid and a higher protein content than the yolk of domestic fowls. The yellow yolk of the pigeon differs most from that of the fowl in its much higher moisture value, but probably differences in the amount of alcohol-soluble and protein materials also exist. The yellow yolk derived from different orders, genera, and species of birds probably varies more in the amount of water than in other fractions, but the yellow yolk from birds of different orders is relatively much alike as compared with yellow and white yolk from the same individual bird.

III. *On the metabolism of the egg yolk of the fowl during incubation*, O. Riddle.—In this study on the changes in the egg yolk during incubation the

attempt was made to determine, by isolation and chemical analysis of the yolks of eggs subjected to various periods of incubation, the relative rates at which the various constituents of yolk are removed and utilized by the embryo.

A differential utilization of the elements of yolk prior to the twelfth day of incubation has not been shown to occur. A study of the unmetabolized yolk of 18 and 20 day stages shows that after the twelfth day the phosphatids are utilized more rapidly than the neutral fats, and the neutral fats are utilized more than the proteins. This order of utilization of these substances persists during the 18 to 20 day period when the embryo's sole source of protein is the remnant of the yolk. The moisture value of the yolk undergoes very considerable fluctuations during incubation. At the twelfth day it is about 9 per cent higher than in fresh undiluted yolk. At the eighteenth day it has fallen to near the value for fresh yolk. At the very end of incubation this value probably rises considerably. Two forms of semisolid yolk bodies which are occasionally present in final stages of incubation were found to be wholly unlike in their chemical composition. Yolk resorbed by the follicle which secreted it shows a more rapid metabolization of the phosphatids (lecithin), the neutral fats are utilized at a somewhat slower rate, while the proteins are metabolized more slowly than either the phosphatids or neutral fats.

IV. *When a gland functions for the first time is its secretion the equivalent of subsequent secretions?* O. Riddle and Adelaide A. Spohn.—A comparison was made of the composition of the albumin secreted by the pigeon's oviducal glands during initial functionings with that of albumin secreted later by these glands. Albumin produced in initial efforts contains a smaller percentage of water and a higher percentage of alcohol-ether-insoluble substance. During a few of the later functionings of the oviducal glands, there probably occurs a gradual change from the initial lower percentage of water to the later higher percentage of water. Partial analyses of the albumin of the pigeon's egg are recorded and the source of variation in the moisture value of this albumin has been identified. The amounts of alcohol-ether-soluble substance, and of inorganic matter probably do not vary widely nor consistently. The amount of water in the egg albumin of the pigeons studied shows no consistent variation in respect to summer and winter. The earliest secretion of the albumin-secreting gland of the pigeon's oviduct is, in several respects, a rather close approximation to the later products of the gland.

V. *The effect of alcohol on the size of the yolk of pigeon's egg,* O. Riddle and E. C. Basset.—In the studies here reported two common pigeons, two blond Ring doves and three hybrids were used. Four of the birds were given alcohol by inhalation daily, with certain exceptions, for four months, and three for only two months. It was found that the yolks produced during the alcoholization period by these birds become smaller than during the prealcoholization period. This decrease occurs even during the season when the yolks of untreated birds normally grow larger than in the earlier period. Yolks produced during a few weeks or months after the alcoholization period are smaller than normal.

VI. *Sexual differences in the fat and phosphorous content of the blood of fowls,* J. V. Lawrence and O. Riddle.—Results are given of a study of the amount of fat and phosphorus in the blood, in relation to sex and sexual activity, in the common fowl.

The blood plasma of female fowls is found to be richer in alcohol-soluble substance and phosphorus than is the plasma of the male. The blood plasma of the normally functioning female fowl contains more alcohol-soluble substance and more phosphorus than does the plasma of fowls with temporarily inactive ovary. The male, the nonlaying female, and the actively laying female fowl are three natural groups of fowls when these are considered from the standpoint of the

fat and phosphorus content of the blood-plasma. The relative distribution of phosphorus in the alcohol-soluble and alcohol-insoluble fractions of the plasma is also different for these three groups of fowls. The differences observed and measured are quantitative.

VII. Variations in the chemical composition of reproductive tissues in relation to variations in functional activity. O. Riddle and J. V. Lawrence. The membranes which immediately surround different sizes of growing ovules of the fowl were analyzed. The phosphatids of all the membranes analyzed were found to exist in amounts relatively large in proportion to the neutral fats. The greatest disproportion of phosphatids to neutral fats, and the largest amounts of phosphatids, apparently were found in the membranes surrounding oöcytes from 5 to 6.5 mm. in diameter.

Analyses were also made of active and relatively inactive shell gland and albumin-secreting glands. In the shell glands the total alcohol-ether-soluble substance is greatest when the gland is inactive and the moisture is greatest when the gland is active. While the alcohol-ether soluble phosphorus does not differ consistently in the active and inactive shell glands, it is perhaps higher in the active glands. In the albumin-secreting glands the alcohol-ether soluble phosphorus is much increased under inactivity. The percentage of water is somewhat larger in the active than in the inactive albumin-secreting glands.

The results are thought to indicate that an increase in the physiological activity of a tissue is accompanied by an increase in its phosphatid content.

A study of the incubation periods of birds, W. H. Bergtold (*Denver: The Kendrick-Bellamy Co., 1917, pp. 109*).—The author reviews the reasons assigned for the variations in the incubation periods of birds which are based on passive conditions, such as an anatomical character (size of body), a physiological character (size of egg), and effects which merely retard or suspend embryonic development.

Attention is also called to a factor that has received little attention, namely bird temperatures. The importance of a study of bird temperatures is stressed because it has been demonstrated that there is an optimum incubation temperature, which perhaps varies with different species. He puts forth the tentative conclusion that "a bird's temperature determines or fixes the time length of its incubation period, and that only an abiding change in the bird's temperature can permanently alter the time length of its incubation period."

The molting of fowls. R. F. Irvin (*New Jersey Stas. Hints to Poultrymen 5 (1917), No. 10, pp. 4*).—A discussion of the molting of fowls from which the conclusion is drawn that it is better to feed the birds liberally during the molting period, and that no gain is made in forcing the molt by starving.

Protein feeds for laying hens, H. L. Kempster (*Missouri Sta. Circ. (1917), pp. 11, figs. 4*).—In continuation of work already noted (E. S. R., 37, p. 773) three 10-bird pens of White Leghorn hens were fed from November 1, 1915, to October 31, 1916, to test the effect of sour milk on egg production. The rations of the different pens were identical with those of the previous year. The average number of eggs per hen laid by the no-meat-or-milk pen during the year was 59.7, by the beef-scrap fed pens 133.6, and by the sour milk fed hens 126.9. On the price basis of the previous year there was a loss of 5 cts. per hen on the no-meat ration, a profit of $1.04 per hen on the beef-scrap ration, and a profit of 92.4 cts. per hen on the sour-milk ratio.

In another test covering the same period linseed meal, gluten meal, and cottonseed meal were compared as sources of protein for laying hens. In this test, which involved three pens of 10 White Leghorn hens each, the birds were fed a mash composed of equal parts by weight of bran, shorts, corn meal, and

of the above protein feeds. During the year the linseed meal pen laid an average of 64.9 eggs per hen, the gluten meal fed hens an average of 63.8 eggs each, and the cottonseed meal fed hens an average of 60 eggs each. The hens seemed to relish the linseed meal mash as much as they did the other mashes. So far as could be observed the hens in all pens were in perfect health throughout the entire experiment with vegetable proteins. No deleterious effects were observed in the use of the cottonseed meal.

Fresh scrap and sour milk are the most economical methods of supplying protein to laying hens. Protein concentrates of vegetable origin alone did not materially increase egg production. It is poor economy not to furnish the laying hen protein concentrate of animal origin."

The poultry keeper's manual, G. ALLMAN (*West. Aust. Dept. Agr. Bul. 47 (1916), pp. 56, pl. 1, figs. 25*).—A practical treatise on the growing of poultry for profit, their diseases and remedies therefor.

Commercial egg farming, S. G. HANSON (*London: Constable & Co., [1916], pp. 81*).—Practical methods applying to English conditions are set forth.

Poultry standards in their relation to utility, J. HADLINGTON (*Agr. Gaz. N. S. Wales, 28 (1917), No. 3, pp. 208–216, figs. 6*).—Standards are given for the White Leghorn, Black Orpington, and Rhode Island Red breeds of fowls, together with photographs which represent the author's interpretation of the ideal character of these breeds. A plea is made for a revision of the scale of points for these breeds set out in the English standards.

American squab culture, E. H. EGGLESTON (*Chicago: Author, 1916, pp. 191, figs. 51*).—A practical treatise for those in the business of raising squabs for profit. The subjects treated are breeds, breeding, marketing, pests and ailments, houses, and equipment. Considerable miscellaneous information is given on various problems likely to arise in the prosecution of the industry.

Squab culture, D. R. WOOD (*Terre Haute, Ind.: The Indiana Squab Co., 1916, pp. 170*).—Practical instructions in raising and marketing squabs.

The raising and care of guinea pigs, A. C. SMITH (*Kansas City, Mo.: Author, 1915, pp. 35, figs. 5*).—This treats of the rearing, marketing, and uses.

The rabbit: How to select, breed, and manage the rabbit for pleasure or profit, W. N. RICHARDSON (*Syracuse, N. Y.: Clarence C. DePuy, 1916, 7. ed., pp. 71*).

DAIRY FARMING—DAIRYING.

Cattle breeding problems and their solution, R. PEARL (*Ann. Rpt. Comr. Maine, 14 (1915), pp. 215–242, figs. 4*).—Progress reports are presented on the following lines of work being conducted at the Maine Station:

The study and analysis of milk records.—In a study of the relation of milk yield to age in dairy cattle (E. S. R., 32, p. 575), a comparison was made of American and Scotch Ayrshires in respect to milk production. Comparing the 7-day weekly yields of American Advanced Registry and Scottish Milk Records Ayrshire cows, it was found that the American cows outyielded their Scottish sisters by 1.23 gal. per week in the 2-year-old class, 2.92 gal. in the 3-year-old class, 2.24 gal. in the 4-year-old class, and 1.76 gal. in the "mature" class. The mature American cows produced about 9 per cent more milk than the mature Scotch cows. The question is raised whether the American standard is high enough to get the best results in the direction of breed improvement.

For the purpose of comparing herds made up of cows of various ages and periods of lactation the author has constructed a dairy efficiency table in which it is assumed that cows from five to seven years of age and during the first month of lactation are 100 per cent efficient, and that cows of any other age

or stage of lactation are less than 100 per cent efficient. The manner in which the table is to be used is shown by examples.

The study of inbreeding in dairy cattle.—A preliminary report is made of a study of inbreeding in American Jersey cattle. Tabulated data and diagrams are presented showing the coefficients of inbreeding for random samples of the general population of both Jersey bulls and cows and of samples of the animals in the Register of Merit. From these it is concluded that American Jersey cattle at the present time may be said, in general and on the average, to be about one-half as intensely inbred, when account is taken of the eighth ancestral generation, as would be the case if continued brother × sister breeding had been followed. That, in general and on the average, Register of Merit animals are less intensely inbred than the general population of Jersey cattle.

Physiology of cattle breeding.—In a study of the normal duration of oestrus in cattle it was found that of 834 successful services which are tabulated 79 per cent occurred within 10 hours after the discovery of heat. No significant differences appeared between the distributions for the different breeds.

A study of 712 cows from the herds of about 150 leading dairymen of Maine shows that on the average these cows were dry about 4 days short of 2 months prior to calving. About 14 per cent of them were dry more than 70 days and about 29 per cent were dry less than 40 days.

In a study of the age of cattle used as breeders by dairymen in the State it was found that of 967 calves included in the statistics 58.9 per cent were sired by bulls less than 3 years of age at time of service. Less than 15 per cent of the calves were sired by bulls 5 or more years old. The bearing of these facts on the progress in dairy cattle breeding is evident, since it is impossible to test the milk producing capacity of a bull's daughters before he is 3 years old. The average age of breeding cows in the study was approximately 5.5 years. Out of 878 calves 166 were the first calves of heifers. The average age of these heifers when successfully served for these first calves was approximately 1 year and 7 months. Three-quarters of the heifers were successfully served for their first calves before they were 2.1 years old.

The Kerry: Its advantages under present conditions, CHEVIOT (*Mark Lane Express, 118 (1917), No. 4483, pp. 206, 207, figs. 2*).—The advantages of the Kerry cattle as compared with the dairy type of Shorthorns and other dairy breeds under present war conditions are pointed out, and notes are given on the origin of the Kerry breed and of the type of the breed known as Dexter Kerry.

Studies from the survey on the cost of market milk production. K. J. MUSSER, G. C. WHITE, B. A. MCDONALD, and H. F. JUDKINS (*Conn. Agr. Col. Ext. Serv. Bul. 7 (1917), pp. 27*).—Results are given of a survey of 193 representative dairy farms in Connecticut made for the purpose of determining the cost of producing milk for the year ended April 30, 1917, and for the month of April, 1917.

It was found that the cost of producing milk on 178 of these farms for the year ended April 30, 1917, was 5.53 cts. per quart. There was an average loss for the year per cow for the 178 farms of $18.42. The cost of producing milk on 179 farms for the month of April, 1917, was 6.29 cts. per quart, with labor at the yearly rates.

The 28 highest-producing herds produced milk on the average for 2.00 cts. per quart below the 25 lowest-producing herds. The greatest percentage of pure-bred bulls and milk records were in the 28 herds with the highest-producing cows, while the smallest percentage was in the 25 lowest-producing herds. The 28 highest-producing herds showed a profit above the net cost of production of $10.86 per cow per year, while the lowest-producing herds showed a loss of $33.75. The average milk production of the 3,258 cows on these 178 farms was

[illegible] per year, whereas the general average for the State is estimated at [illegible].

[illegible] latest data show detailed cost data for each farm, and averages for each [illegible] in the State.

The milk supply—a suggestion, R. S. WILLIAMS and ELFRIDA C. V. CORNISH (*[illegible], England: University Press, 1917, pp. 10, figs. 3*).—The authors call [illegible] to the present unsatisfactory method of handling the milk supply of [illegible] and suggest a scheme of handling raw milk. The essentials of this plan [illegible] that the milk be taken from healthy cows under cleanly conditions, cooled [illegible] three hours after milking, either at the farm or at factories within [illegible] of a group of farms, put into sterile hermetically sealed cans, shipped in [illegible] refrigerator cars to the destination, and kept cool until delivered to the consumer.

Manual of milk products, W. A. STOCKING (*New York: The Macmillan Co., 1917, pp. XXVII+578, pls. 16, figs. 90*).—In this manual the author has brought [illegible] the more important findings in regard to the handling of dairy products. The subject is treated under the headings of milk secretion, the chemical [illegible] composition of milk, factors that affect the composition of milk, physical properties of milk, the testing of milk and cream, market milk, certified milk, butter [illegible], cheddar cheese, fancy cheeses, farm dairying, condensed and powdered [illegible], fermented milk, ice-cream making, and the relation of bacteria to dairy [illegible].

Modern pasteurization at low temperature, J. VANDERLECK (*Agr. Gaz. Canada, 4 (1917), No. 7, pp. 614–619*).—Results are given of experiments conducted [illegible] department of bacteriology of Macdonald College in which milk was pasteurized at different temperatures in a small pasteurizer on a dairy farm. [illegible] bearing on the subject obtained in the course of an investigation of the [illegible] supply by municipal authorities in the district of Montreal are also [illegible].

The author concludes that "raw milk produced under sanitary conditions and [illegible] pasteurized at 145° F. for 20 minutes contained virulent coli bacteria, causing [illegible] in infants. Pasteurized milk of reliable concerns contained during the [illegible] so many coli bacteria that it was bound to have a harmful effect. Milk [illegible] heated at 145° for 30 minutes by numerous small concerns contained so [illegible] coli bacteria (virulent gas producers) that the milk was unfit for consumption. In milk pasteurized at 152° the coli bacteria had lost their virulence [illegible] most of them were killed. In milk pasteurized at 152° in the proper way, [illegible] food value is unimpaired, and as the cream will not rise to the top it will [illegible] impossible to reduce its value as a beverage by skimming the cream off."

Cause and prevention of mold on butter, E. G. HASTINGS (*Proc. Wis. Butter-[illegible] Assoc., 16 (1916), pp. 145–152, fig. 1*).—In this popular summary of the [illegible] and prevention of mold on stored butter, the author gives results of [illegible] of bleaching powder and hot water on mold spores.

In a 1:3,330 solution of bleaching powder or chlorid of lime, mold spores [illegible] killed after an exposure of 10 minutes, and in solutions of 1:16,550 to [illegible] after an exposure of 20 minutes. Trials of the same mixture of spores [illegible] in the death of all spores in water heated to 131 and 140° F. An [illegible] of 15 minutes in water with a temperature of 122° failed to kill the [illegible] spores. The author states that butter tubs and liners should be placed [illegible] a few minutes in water heated to 150° and as a further precaution the [illegible] should also be pasteurized. If only mold spores are present salt is [illegible] to prevent their germination.

Minnesota creameries; cheese, ice cream, and canning factories (*St. Paul, [illegible]: Minnesota Dairy and Food Dept., 1916, pp. [4]+69, figs. 15*).—Dairy sta-

tistics for the State are tabulated and lists are given of Minnesota creameries and cheese, ice cream, and canning factories.

Siberian butter and cheese (*N. Y. Produce Rev. and Amer. Creamery*, (*1917*), *No. 14, pp. 550, 552, 554*).—In this article, which is taken from the *Weekly Bulletin* of the Canadian Department of Trade and Commerce, it is stated that the butter industry of Siberia began with the introduction of railway transportation in 1894. The growth of the industry is one of the striking features of the economic development of the country. In 1913, 72,700 tons of butter was exported from Siberia to Western Europe.

Attempts are also being made in an experimental way to develop the Siberian cheese making industry. These are meeting with success, and on account of the natural advantages of the country for cheese making it is thought the industry will rapidly grow in importance.

Notes are given on the growth of cooperative enterprises and on the effect of the European war on the butter and cheese industry of Siberia.

Cheese making on an Irish farm, MABEL O BRIEN (*Better Business*, (*1917*), *No. 3, pp. 214–225*).—This is an account of how an Irishwoman has made cheese making both pleasant and profitable on a dairy farm located too far from market for the sale of whole milk.

Experiments on the preparation of homemade rennet, A. TODD and ELSIE C. V. CORNISH (*Jour. Bd. Agr. [London]*, *24* (*1917*), *No. 3, pp. 307–312*).—Results are given of experiments on the home preparation of rennet from calves' stomachs, the method used being a modification of that already noted (E. S. R., 36, p. 378).

By the method described rennet extracts approximating in strength commercial rennet were often obtained. These extracts retained their coagulating properties for a period of several months, and often increased in strength during storage. The number of lactose-fermenting organisms in the extracts decreased with time. Several kinds of cheeses made by the use of rennet extract prepared ripened normally and were of good quality.

Experiments with pepsin to replace rennet, D. W. STEUART (*Jour. Bd. Agr. [London]*, *24* (*1917*), *No. 3, pp. 313–315*).—An attempt was made to prepare a pepsin solution which would keep fairly well and give results similar to those obtained with standard rennet extract. The pepsin solution was prepared by mixing 4½ parts by weight of a 1:3,000 solution of pepsin, 1 part of hydrochloric acid, and 10 parts of salt to 50 parts of water. In cheese-making experiments the pepsin solution compared favorably with rennet extract when warm (90° F.) milk was used, but when the milk was ripened to a less extent the time of coagulation was much longer with the pepsin than with the rennet.

The results of another test indicate that 1 oz. of soluble pepsin powder will curdle only 75 gal. of sweet milk.

VETERINARY MEDICINE.

[Veterinary handbooks] ([*Portland, Oreg.*]: *Vet. Sci. Assoc. Amer.*, [1917], *pp. 171; pp. 75, pl. 1; pp. 91, pl. 1; pp. 87, pls. 7; pp. 123, figs. 4*).—The first of these handbooks, dealing with Veterinary Medicines, Their Actions, Uses, and Dose, is by G. F. Korinek. The other four, consisting of (2) Notes on Diseases of Cattle, Cause, Symptoms, and Treatment; (3) Notes on Diseases of the Horse, Cause, Symptoms, and Treatment; (4) Notes on Veterinary Anatomy, and (5) Notes on Diseases of Swine, Sheep, Poultry, and the Dog, are by G. Korinek.

[Diseases and parasites of live stock], L. B. BARBER (*Guam Sta. Rpt. 1916, pp. 44–49, 53, 57, 58, pl. 1, figs. 4*).—*Acacia farnesiana* known as aroma is

[illegible]*agon aciculatus* known as "enefuk" are troublesome to horses allowed [illegible] in pastures. The thorns of the former plant cause local inflammation [illegible] results in the falling out of the hair, leaving raw sores, or the skin drying [illegible] peeling off, leaving a disfigured appearance, while the adherent awn of the [illegible] plant causes conjunctivitis.

[illegible] of the arsenical dip kept the cattle free from ticks, which was found impracticable through picking and the oil and kerosene treatment. The importance [illegible] keeping the stock free from ticks is emphasized by the work of the year. [illegible] of the temperatures of four animals suffering from tick infestation are [illegible].

Brief mention is made of the kidney worm (*Stephanurus dentatus*), a lungworm (*Metastrongylus apri*), and a cecum worm (*Trichuris crenata*) in swine, the first two of which were described in detail in a previous report of the station (E. S. R., 35, p. 877). Infestation by the cecum worm results in emaciation and rough, scaly skin, and diarrhea is present in the early stages. Post-mortem examination shows the mucus surface of the large intestines, especially that of the cecum, to be covered with a thick yellowish crust, the removal of which reveals many pitted ulcers, particularly in chronic cases. The parasites in many instances show through the serous coat of the intestines, and a marked anemia of the liver is generally present.

The nodular worm (*Œsophagostomum columbianum*) and the fourth stomach worm (*Hæmonchus contortus*) appeared in the station herd of goats and caused the death of several kids. But few of the chicks in the station flock were lost during the year from diseases or intestinal parasites. A list of 7 external and 7 internal parasites collected, based upon identifications by the Bureau of Animal Industry of the U. S. Department of Agriculture, is included.

Report of the veterinary department], J. W. Connaway and A. J. Durant (*Kansas Sta. Bul. 147 (1917), pp. 54–57*).—Continuing the study of hog cholera and the factors concerned in immunity against the disease (E. S. R., 35, p. 878), preliminary investigation indicated that "no relation exists between the complement-fixation reaction and the potency of the antihog-cholera serum, and that the reaction observed was due to other immune bodies than the specific immune bodies of hog cholera." It is indicated, however, that these conclusions should not be accepted as final until proved by further work.

The contagious abortion investigations were continued in cooperation with the dairy husbandry department and a number of cattle breeders in various parts of the State. Of 42 herds tested during the year for contagious abortion by the complement-fixation test, 31 proved to be infected. Of 638 animals tested, 241 yielded a positive reaction. Data on the question of the transmission of contagious abortion infection from immune positive-reacting dams to their apparently healthy offspring in utero or subsequent to birth through infected milk and the permanency of this infection in the offspring are submitted. While it is considered that more complete data will be necessary for final conclusions, from the data at hand it is provisionally concluded that "the probability of the abortion infection passing from an immune positive-reacting dam to the calf in utero is not great; or, if such apparently normal calf is infected at birth, the abortion infection is probably not conserved in its tissues until the next breeding period. Moreover, the danger of the permanent transmission of abortion infection to the calf through raw milk is small."

Annual report of proceedings under the diseases of animals acts, the markets and fairs (weighing of cattle) acts, etc., for the year 1916, A. W. Anderther (*Bd. Agr. and Fisheries [London], [Vet. Dept.], Ann. Rpts. Proc. 1916, pp. 28*).—This reports upon the occurrence of and control work with foot-and-mouth disease, of which there was one outbreak, and hog cholera during the

year. In hog cholera work the serum treatment was resorted to from June after which date slaughter in suspected outbreaks was limited to animals for diagnostic purposes.

Report on operations of the veterinary sanitary service of Paris and the Department of the Seine during the year 1915, H. MARTEL (*Rap. Opér. Serv. Vét. Sanit. Paris et Dépt. Seine, 1915, pp. 161, figs. 17*).—This is the usual report (E. S. R., 35, p. 279) giving a detailed account of the work of the year.

Annual report of the Bengal Veterinary College and of the Civil Veterinary Department, Bengal, for the year 1915–16, A. SMITH (*Ann. Rpt. Bengal Vet. Col. and Civ. Vet. Dept., 1915-16, pp. 4+II+5+VIII+3*).—This is the usual annual report (E. S. R., 35, p. 483).

Animal diseases regulations with notes on diagnoses, F. E. LIONNET (*Dept. Agr. Mauritius, Gen. Ser., Bul. 7 (1916), pp. 26*).—The regulations in force in Mauritius against animal diseases, which were completely remodeled in 1915, have been brought together in this report. Short notes on the diagnoses of the various infectious diseases specified in the regulations are included.

Manure disposal as a factor in the control of parasitic diseases of live stock, M. C. HALL (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 5, pp. 667–678*).—The author calls attention to the fact that the proper disposal of manure is the first step to be taken in the control of parasitic infestation of live stock.

The poisonous properties of the two-grooved milk vetch (Astragalus bisulcatus) (*Wyoming Sta. Bul. 112 (1917), pp. 59–67, fig. 1*).—This brief preliminary report upon the two-grooved milk vetch, presented at this time in order to warn stockmen of the poisonous nature of the plant, consists of two parts, the first (pp. 59–65), by O. A. Beath, dealing with the chemical properties of the plant; and the second (pp. 66, 67), by E. H. Lehnert, with its physiological effect, etc.

Milk vetch, which grows on the plains and in the valleys throughout the Rocky Mountain region, appears during the month of May and goes to seed the latter part of July. A description and an analysis of the plant by Knight, Hepner, and Nelson have been previously noted (E. S. R., 20, p. 135). The plant has proved to be poisonous to cattle, from 80 to 90 per cent of the affected animals dying, and suspicion is held regarding its effect upon sheep. It is found that water easily removes the active poison from green or air-dried material, and that all parts of the plant contain poison with a slight excess in the leaves. The poison is neither precipitated by basic acetate of lead nor decomposed at the boiling point of water. It is nonalkaloidal, and the fact that it can be deprived of its toxicity by boiling with dilute acids indicates its probable glucosidic character. A definite crystalline substance has been isolated giving chemical reactions common to glucosids. Thus far no chemical antidote has been obtained, but, as indicated by the physiological action of the poison, drugs that stimulate the heart and nervous system should prove beneficial in the case of vetch poisoning.

Active immunization with sensitized and nonsensitized bacteria, H. SWIFT and R. A. KINSELLA (*Proc. Soc. Expt. Biol. and Med., 14 (1917), No. 6, pp. 120–122*).—In the experiment noted four types of vaccine were studied: Fresh stock vaccine killed at 56° C., sensitized stock vaccine killed at 56°, freshly prepared sensitized vaccine killed at 56°, and an alcohol precipitate of sensitized vaccine. Type I pneumococcus was used in all the vaccines. Mice, guinea pigs, and rats were used as experimental animals, the rats being found the most satisfactory for comparative studies.

The results showed that in from 6 to 10 days after the last immunizing dose there was a higher degree of immunity in the plain vaccine series, but this fell off rapidly. In the series immunized with freshly sensitized vaccine the

...ity, though present, was less marked early, but increased after from 12 to ... No parallelism was observed between the degree of active immunity ... amount of agglutinin and bacteriotropin in the serum of the immune ... Agglutinin was demonstrated only in the serum where plain stock vaccine ... was used. Bacteriotropins were much stronger in the serum of ... treated with this vaccine than in the serum of animals treated with ... prepared sensitized vaccine killed at 56°. This indicates that "animals ... possess a high degree of active immunity and still show practically no ... in their serum." It is suggested "that the immunity is due in part ... immunity and not due entirely to antibodies circulating in the blood ...."

Toxin and antitoxin of and protective inoculation against Bacillus welchii, ... and IDA W. PRITCHETT (*Jour. Expt. Med., 26 (1917), No. 1, pp. 119–...*).—"Antitoxic serum prepared from a given culture of *B. welchii* is neutralizing for the toxins yielded by the other four cultures of that microorganism. ... toxin is protective and curative against infection with the spore and ... vegetative stages of *B. welchii* in pigeons. The limits of the protective and ... action are now under investigation."

Glanders in Austria from 1911 to 1913, J. SCHNÜRER (*Wiener Tierärztl. ... Arch., 1 (1914), No. 2, pp. 83–93; abs. in Vet. Rec., 28 (1916), No. 1438, pp. ...*).—An account of glanders control work in Austria during 1911, 1912, ... 1913.

Neosalvarsan in the treatment of epizootic lymphangitis, E. HOUDEMEYER (*... in Vet. Rec., 29 (1917), No. 1496, pp. 372, 373*).—Of the various methods ... administering neosalvarson the author prefers intravenous injection since ... subcutaneous injection is painful and subcutaneous injection should be dis... altogether on account of the persistent edemas which it produces. A ... of 1.5 gm. which is injected corresponds to 1 gm. of salvarsan. Of seven ... affected with epizootic lymphangitis that were treated with neosalvarsan ... recovered after the first injection and the seventh after the second. "It is ... advisable to combine surgical intervention with the administration of ... salvarsan by puncturing the abscesses and treating the wounds with antisep... as in this manner the progress of recovery is hastened." Attention is ... to the importance of commencing treatment before the disease has be... generalized.

Studies on the paratyphoid-enteritidis group.—I, II, C. KRUMWIEDE, JR., ... S. PRATT, and L. A. KOHN (*Jour. Med. Research, 34 (1916), No. 3, ... 355; 35 (1916), No. 1, pp. 55–62*).—Two papers are given.

... of fermentation for the differentiation of B. paratyphosus "A" from other ... of the paratyphoid-enteritidis group.—"In a series of cultures repre... nearly all the pathogenic types of the paratyphoid-enteritidis group, a ... of cultures, including all the types agglutinatively *B. paratyphosus* 'A', ... to ferment xylose. We suggest, if the study of further strains shows ... this is a constant characteristic, that the xylose-negative types from man ... considered the paratyphoid A group on cultural grounds. Within this cul... group are encountered strains, presumably pathogenic, which differ ag... relatively from the normal 'A' type."

... observations on the reaction in litmus milk as a method of biological dif....—"With the strains we have studied, the reaction in litmus milk of ... different members of the paratyphoid-enteritidis group is a gradient one. ... though most of the paratyphoid 'A' types produce alkali more slowly than ... other members of the group, this difference is quantitative only, and inter... degrees of reaction, both temporal and quantitative, largely destroy ... differential value of the medium. The usually described qualitative reac-

tion, therefore, has not been verified by our results. With milk conta
Andrade indicator somewhat sharper differences are obtained with
the strains, although the general quantitative character of the
preserved. This is probably due to the greater delicacy of this indi
coincident reduction of the color. Some strains, however, react irre
on this medium, as on litmus milk, and show its lack of value as a qua
method of differentiation."

Antitetanic serum in articular rheumatism, W. H. DALRYMPLE (*Amer. J.
Vet. Med., 12 (1917), No. 8, pp. 552, 553; Jour. Amer. Vet. Med. Ass
(1917), No. 5, pp. 692-694*).—The author, at the Louisiana Experiment Sta
reports the successful use of antitetanic serum in a case of articular
tism in a jack. Three doses of 500 units each were injected with appa
complete cure.

The vitality of the tubercle bacillus outside the body, M. B.
(*Indian Jour. Med. Research, 4 (1917), No. 4, pp. 627–650*).—The vitality of
tubercle bacillus was studied under varying external conditions.

The bacilli in the sputum when exposed to direct sunlight remained
for six hours, but were killed after eight hours' exposure. On exp
diffused daylight the organisms remained alive for six days, but were
after exposure for eight days. Tubercle bacilli were kept alive and vir
for 309 days in sputum which was kept in darkness, even when it was
pletely desiccated. Living tubercle bacilli were isolated from decom
sputum after 20 days, but not after 26 days. The bovine type was fo
be more resistant to sunlight and diffused daylight than the human type. W
exposed to electric light the bovine bacilli were found alive after 74 day
were dead after 100 days. From three to four hours' exposure in direct
light and from three to four days in diffused daylight were found ne
for sputum to become sufficiently dried to be capable of being reduced to

Incidence of bovine infection of tuberculosis in children, CHING YUEN
(*Edinb. Med. Jour., 18 (1917), pp. 178–196; abs. in Abs. Bact., 1 (1917),
pp. 266, 267*).—Of 281 cases of tuberculosis examined in Edinburgh the
type of tubercle bacillus was isolated from 78.4 per cent of cases under 5
of age, from 70.3 per cent of cases between the ages of 5 and 16 years and
only 7.8 per cent of patients over 16 years. The bovine bacillus was
in 6 of 9 children who died of tuberculous meningitis and abdominal tuber
losis. The tuberculin test yielded positive results in 37.5 per cent of chi
fed on raw milk and in only 15.4 per cent of children fed on boiled milk.

The etiology of hog cholera.—Second report, F. PROESCHER and H. A.
(*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 5, pp. 609–624, figs. 13*).—C
uing the study previously noted (E. S. R., 37, p. 382), data are reported wh
deal mainly with the blood changes, continued studies on the staining
erties of the virus, microscopical changes in the organs, and the cultivation
the organism.

The blood changes in hog cholera were investigated with 12 pigs. Tab
data showing the absolute leucocyte count and the differential count, bef
after incubation, are submitted. It is noted that the blood counts can not
regarded as conclusive on account of their incompleteness. The data obtain
however, show that in hog cholera there is at first a decrease in the abs
leucocyte count. In some of the animals a leucopenia was observed.

Shortly before death there may be a considerable increase in leucocytes.
the majority of the cases the differential count showed a decided increase
the polynuclear neutrophils, with a decrease in the lymphocytes. The
clear eosinophils and basophils are greatly diminished in number or
pear entirely. Neutrophil myelocytes and plasma cells may appear

...death. If the increase in leucocytes just before death is occasioned pri... by the hog-cholera virus or is due to a secondary infection with *Bac...suipestifer* or *suisepticus* can not be determined." Two pigs showing a ...ante mortem leucocyte count were secondarily infected with *B. suipestifer*. ...staining method used for blood smears is briefly as follows: The air-... smears were stained in a methyl alcohol solution of eosin, methylene blue, ...blue for three or four minutes, immersed for a few minutes in 96 ... alcohol, washed in water, superficially dried, and then floated for 16 ... in a diluted Giemsa solution (1:10) alkalized with two drops of 1 per ... carbonate or borax solution to 10 cc. The smears were then thor... washed in running water, air-dried, and mounted in cedar oil or in ...oil. This method is considered to be superior to that previously de...

...observed histological changes in hog cholera which will be reported ... detail, together with the macroscopic changes, are noted.

...cultivation of the virus both the blood and organs of pigs which suc...cumbed to hog cholera were used. The blood was collected aseptically, defibri... centrifugalized, and the serum passed through a Berkefeld filter. The ... was tested aerobically and anaerobically for common bacterial contami...tion.

...rfectly sterile serum was used for culture purposes. Unfiltered sterile ...carcinomatous ascites and sterile unfiltered horse serum were used as culture ...Rather was placed in sterile test tubes to which a piece of fresh kidney ...tissue from a guinea pig or rabbit was added, and covered with sterile ... oil. The tubes were then incubated for a week at 37° C. Tests were ...to insure complete sterility.

...sterile culture tubes filtered hog-cholera serum equal in amount to the ...dium was added by means of a sterile pipette. In one case blood ...directly from the heart which proved to be sterile was added directly to ...re medium. Cultures were made from the organs by taking pieces ...ly removed from the dead animal and immersing them in unfiltered ...carcinomatous ascites or unfiltered sterile horse serum and then cov... with sterile paraffin oil. The tubes which showed a high secondary in... were discarded. Those which were but slightly contaminated after in... for a week were filtered through filter paper and then through a Berke... filter. The filtrates so obtained were used for subcultures, as previously ...ribed.

...two or three weeks the culture medium showed a slight opalescence ... gradually disseminated through the liquid. In cultures made from ...virus with the addition of a piece of fresh tissue a growth was ob... in four weeks. In others, however, where the presence of the cocci ... demonstrated microscopically, hardly any change in the culture medium ... be noted. Several hundred cultures so prepared were examined micro... The data reported confirm the previous microscopic findings.

...the staining method described it was possible to demonstrate large ... of microorganisms attached to the red cells. These findings corrob... of Meyer (E. S. R., 32, p. 475), who showed that hog-cholera virus ... tenaciously to the red blood cells and that it was impossible to re... virus by repeated washings with normal saline solution followed by ...centrifugalization.

...indicated that "as soon as sufficiently distant subcultures are obtained, ... the transmission of the original virus is absolutely excluded, animal ...ments will be made to furnish conclusive proof that this organism is the ...tive agent of hog cholera."

The virulence of hog-cholera blood at different periods during the dis... R. A. WHITING (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 4, pp. 477–...*).—The results of a study at the Indiana Experiment Station covering a per... several years show that there is a gradual increase in the virulence of ... cholera blood as the disease progresses from four to eight days following ... lation. Eight-day blood was found to be the most virulent.

It is noted that in the production of virus for serum production hogs may ... killed at six days following inoculation, providing there is a correspond... temperature and a manifestation of symptoms, especially weakness. Blood ... tained on slaughter seven or eight days following inoculation was found ... more virulent than any of the blood obtained by tail bleedings.

See also a previous note by Craig (E. S. R., 34, p. 783).

Summary of observations on 1,470 hogs hyperimmune to hog chole... H. C. H. KERNKAMP (*Jour. Amer. Vet. Med. Assoc., 51 (1917), No. 4, pp. 5...-540*).—Observations on 1,470 hogs used in the production of antihog-... serum at the Minnesota State serum plant, covering a period of approxi...-37 months, are reported.

During the first half of the period of observation two methods of hyper... munization were used, designated as "slow intravenous" and "intraven... In the slow intravenous method an interval of from four to eight days ... the first and the second injection of the necessary dose of virus to ... condition of hyperimmunity was allowed. In the intravenous method the ... tion was done at one operation, the virus being injected into the ... auricular vein under a pressure of from 3 to 6 lbs. per square inch. A ... amount of virus is necessary in this method, and it is considered much ... satisfactory than the slow intravenous method.

Serum therapy for trichinosis, B. SCHWARTZ (*Jour. Amer. Med. Ass... (1917), No. 11, pp. 884–886*).—The report by Salzer[1] that animals fed with ... fested meat later than 24 hours after the administration of serum from a ... valescent animal prove to be immune, that infested meat mixed with ... serum does not produce trichinosis in animals to which it is fed, and that ... mune serum injected into animals suffering with the disease produces a ... effect led to the investigation here reported, which is summarized by the ... as follows:

"Serum from animals convalescent from trichinosis when injected into ... animals did not produce immunity to trichinosis in the latter. Trichinous ... mixed with serum from animals during the active or convalescent stage of ... disease proved to be still capable of producing the disease. Animals ... fected and harboring trichinæ in their muscles were not immune to ... infection when fed trichinous meat. Serum from a trichinous animal ha... observable ill effects on the larvæ freed from their cysts by artificial diges... None of the results of the experiments appear to be in harmony with the ... sertions made by Salzer concerning the value of serum from convalescent ... mals as a prophylactic or curative agent in trichinosis."

Special equine therapy, M. R. STEFFEN (*Chicago: Amer. Vet. Pub. C... pp. 212*).—This work gives special attention to diseases and conditions ... are unnamed, atypical, or of infrequent occurrence, the discussions being ... from the viewpoint of the general practitioner.

Trichomonasis of chicks: A new and highly fatal disease, J. WE... (*Jour. Bact., 2 (1917), No. 4, pp. 441–445, figs. 2*).—Large losses of chicks ... ranches in the Puget Sound region of Washington from disease led to the ... tigation here reported. It is concluded that a protozoan of the genus Tr...

[1] Med. Rec. [N. Y.], 91 (1917), No. 6, p. 261.

... to which the name *Trichomonas pullorum* is given, is the cause. The dis... appears the second week after hatching, commonly about the tenth day, ... only being affected. Stock that is a month old proves resistant, ... cases that reach this age usually recover. Diarrhea is absent in ... stages but is present in the chronic stage. In the acute stage the ... succumb in a day or two, and only the more vigorous birds enter ... stage. On the ranch where the investigation was first made 800 of ... hatched at one time from a thrifty stock of White Leghorns died ... days after hatching.

"Examination showed that a single species was present, frequently in ... numbers; that it was not present in healthy stock, or in newly ... chicks; that healthy chicks kept in cages with sick chicks developed ... and showed the protozoan in the ceca; and finally that control chicks ... develop the disease when kept under identical conditions. We con... therefore, that this protozoan is the cause of the disease."

RURAL ENGINEERING.

Evaporation from the surfaces of water and river-bed materials, R. B. ... (U. S. *Dept. Agr., Jour. Agr. Research, 10 (1917), No. 5, pp. 209–262, pls.* ...). Part 1 of this report deals with evaporation from water surfaces. Experiments on the evaporation from circular land tanks of different diam... showed that "over the range of areas 0.785 sq. ft. to 113.1 sq. ft., or ... 1 to 12 ft., the range in evaporation for the year is 76.18 to 49.16 in., ... in percentage 154.9 to 100 per cent."

In experiments on the relation between evaporation from circular tanks and ... tanks set 3 ft. in the ground, of equal exposed water surface, circular ... with diameters of 3.39 ft. and 2 ft., and square tanks of dimensions 3 by 3 ... and 1.77 by 1.77 ft. were used. "Based upon the totals, the evaporation from ... square tank is 102.7 per cent of that from the circular one of the ... area. That from the other square one is 103.5 per cent of that from the ... one of the same exposed area. Based upon mean weekly averages, ... figures are 104.7 and 104.9. In the case of the 9 sq. ft. area the ratio, ... divided by area, is 0.15 greater in the case of the square tank than ... the circular one. This has apparently caused an increase in evaporation ... per cent. For the tanks of 3.14 sq. ft. area there is a corresponding in... of 0.26 in the ratio and an increase of 3.5 per cent in evaporation."

Experiments on the variation of evaporation with the depth of the tank set ... the ground showed that "during the months when the cooling effects of the ... were not so great, the shallow tanks show the greater evaporation, but ... when the day temperatures and the heat storage of the shallow tanks ... more than offset by the low night temperatures, the shallow tanks indicate ... evaporation. This difference in evaporation is not great, but for gen... use a tank not less than 2 ft. deep is recommended, since its contents will ... become heated or cooled as quickly as those of the shallower tank. The ... difference between the results from the 6 ft. tank and the 3 ft. one is so slight ... that under all ordinary conditions there is no necessity for using a tank deeper ... than 3 ft."

Experiments on evaporation from flowing water showed that "for the first ... of tanks evaporation from the flowing water was 107 per cent of that from ... still water under exactly the same conditions. For the other set, a tank ... ft. long, the evaporation from the flowing water was 108 per cent of that ... still water. . . . There seems to be no definite relation between evaporation ... velocity within the limits of the experiment."

Experiments on effects of temperature on evaporation and on the extent of the evaporation depths from land pans to larger open water surfaces under the same conditions by use of a floating pan are also reported, together with results of meteorological observations taken in connection with evaporation investigations in general.

Part 2 of the report deals with evaporation from river-bed materials. "The final figures indicate that for the period of the sand-tank work the evaporation from the surface of the sand from the smaller tank, approximately 2 ft. in diameter, was about 7.5 per cent greater than from the larger tank. This figure does not check that found for the water tanks, the corresponding difference there being 3.5 per cent."

Other data of these experiments are graphically reported.

Use of power and rates for irrigation pumping. G. R. KENNY (*Jour. Electricity, 38 (1917), No. 12, pp. 496, 497, fig. 1*).—Data on the character of electric pumping plants in their relation to power rates, compiled from the practice of a hydroelectric company in California, are reported. Some data from typical districts on acreage irrigated and cost of power per acre are given in the following table:

Data on irrigated districts served.

	Alfalfa territory.	Citrus fruit territory.	Farm territory.
Acreage irrigated	22,893	9,495	.....
Horsepower used	1,623.84	1,470.75	.....
Acres per horsepower	14.10	6.50	.....
Average acres per horsepower, all classes of crops	.....	.....	.....
Average costs per acre	$3 to $4	$6 to $7	About $4.

"Practically all of the pumps in use are of the direct-connected centrifugal type. For the deep well pumping, the turbine and plunger types of well pumps are installed. The pumping motors on the system vary in size from 3 to 75 horsepower, only a very few being in excess of 15 horsepower, while the average at the end of 1916 was 10.4 horsepower."

The rates used, based on the maximum demand, are given in the following table:

Rates based on maximum demand.

Months continuous service.	Contract flat rates, per horsepower.	Meter rates, meter charge of 0.5 ct. per kw.-hour added to following demand charges.
3	$17.50	$10.40
4	21.55	12.50
5	25.15	14.30
6	28.50	15.95
7	31.65	17.45
8	34.55	18.85
9	37.35	20.10
10	40.00	21.30
11	42.55	22.40
12	45.00	23.45

A survey of all gas engine pumping plants operating within one mile of the company's lines showed that "the gas engines were used where but little irrigation was required, when water was pumped from ditches, or where water was needed to supplement ditch irrigation after the ditches had gone dry. The engines are generally run for only a short period each year. About 1,200 e

... were visited and the conclusion reached, after the information obtained ... tabulated, was that in the majority of cases the plants now pumping by ... engines could not be taken over for electric service to the advantage of ... the consumer or the company. There are certain classes of power irriga- ... which the gas engine, due to its low annual cost, if operated but little, ... assist with considerable economy as compared with electric power."

The use of cement on national irrigation works, A. P. DAVIS (*Proc. Nat. ... Cement Users, 9 (1915), pp. 258–265, figs. 7*).—This is a statement of the ... by the U. S. Reclamation Service of cement in irrigation structures. ... its organization the Reclamation Service has used about 1,500,000 bbls. ... of cement, representing about as many cubic yards of concrete. It has ... about 7,000 miles of canals, 69 tunnels aggregating 111,000 ft., has built ... dams and 25 diversion dams, about 2,000 concrete structures upon ... and about 32,000 wooden structures. It has built altogether 2,008 ... with an aggregate length of about 62,000 ft. It has built 436 offices ... and about as many other buildings used for barns and store- ...

Improvements proposed in the javellization of potable water for field ... COMTE (*Jour. Pharm. et Chim., 7. ser., 14 (1916), No. 9, pp. 261–265; ... Chem. Abs., 11 (1917), No. 6, p. 678*).—A summary of service experience ... the recommendation that a solution of 20 gm. of powdered potassium ... in 1 liter of hot water and 20 gm. of concentrated sulphuric acid ... for cleaning and deodorizing containing vessels.

It has been found that a uniform method of javellization is not applicable, ... the variation in the organic impurities in the water and variations in ... solution. It is pointed out that a definite amount of a given Javelle ... corresponds to a given water. This ratio is determined rapidly by ... cc. of the water to be examined into each of five vessels and adding, ... 1, 2, 3, 4, and 5 drops of a 1:100 strength Javelle solution. After ... and a wait of 20 minutes about 1 cc. of a potassium iodid starch re- ... added and again stirred. Several samples will then be blue. The ... of lowest concentration giving a blue color indicates the number of ... undiluted Javelle solution necessary for the treatment of 10 liters of ... water with the same dropping instrument. The starch reagent contains ... each of starch, potassium iodid, and crystalline sodium carbonate.

Experiments upon the purification of sewage and water at the Lawrence ... Experiment Station during the year 1915 (*Ann. Rpt. Dept. Health Mass., 1 ... pp. 377–429, figs. 4*).—This section of the report gives in detail the re- ... of the water and sewage purification experiments at the station for the ... 1915.

Annual report of the Baltimore County [Md.] roads engineer for the year ... December 31, 1916, W. G. SUCRO (*Ann. Rpt. Roads Engin. Baltimore ... [Md.], 1916, pp. 87, pl. 1, figs. 17*).—This is a report of work and expendi- ... road construction, maintenance, and repair in Baltimore County, Md., ... 1916.

Influence of grading on the value of fine aggregate used in Portland ... cement concrete road construction, F. H. JACKSON, JR. (*U. S. Dept. Agr., Jour. ... Research, 10 (1917), No. 5, pp. 263–274, figs. 10*).—Experiments showing in ... general way the effects of variations in the grading of fine aggregate on the ... resistance to wear of road concrete are reported.

It was found "that but few naturally occurring concrete sands are as coarse ... those making the strongest mortars, according to these tests. Neither has ... been overlooked that the best mortar, when combined with stone or ...

gravel without reference to its grading, will not necessarily produce the ... concrete. A poorly graded, coarse aggregate will unquestionably require ... mortar than will a well-graded one. Likewise, a coarse aggregate containing a large amount of small stone will allow the use of a somewhat finer sand than when the larger-sized stones predominate. . . . It might be economically practical to use a graded rather than a naturally occurring concrete aggregate in such important work as concrete road construction if, by so doing, the life of the pavement can be prolonged."

The effect of alkali on Portland cement, K. STEIK (*Wyoming Sta. Rpt. 1917*), *pp. 71–122, figs. 19*).—Experiments are reported in which it was found that cement put into solutions of alkali salts set as well as in water. In solutions of sodium sulphate $CaSO_4.2H_2O$ is formed. In solutions of magnesium sulphate $CaSO_4$, $2H_2O$, and $Mg(OH)_2$ are formed. In solutions of sodium chlorid a silicate is formed. The high percentage of sodium in this silicate is likely the reason for the increase of insoluble sodium in cement.

"Sodium chlorid in solution or its presence in solution with other alkali salts has its effect chiefly through a solvent action.

"Of the solutions tested, the 5 per cent sodium sulphate solution had the greatest disintegrating effects. Solutions containing chlorids, sulphates, carbonates had the least effect. Mortars disintegrate faster than neat cement. The formation of compounds with molecular volumes larger than the molecular volume of calcium hydroxid is not the cause of disintegration of cement. The ultimate cause of the disintegration of cement by alkalies is due to the new forming compounds with the elements of cement, which subsequently are removed from the cement by solution."

Spontaneous combustion as a cause of fires, A. R. LAMB (*Iowa Sta. Circ. 36 (1917), pp. 4*).—This circular deals with the spontaneous combustion of drying oils, and especially hay, and briefly outlines means of prevention.

"The self-heating of hay generally reaches a dangerous point about five or six weeks after being mowed or stacked. Means of prevention must be employed before this time. The most effective means is proper curing of the hay before storing it. . . . The hay should be carefully cured until the stalks are so dry that no moisture can be squeezed out by twisting a wisp in the hands. It must also be free from outside moisture, as dew or rain, put into the barn.

"If the hay has unavoidably been put into the barn when somewhat damp, it should be watched for signs of heating. The first evidence is sometimes a morning, a day or two later, when the mow is covered with moisture condensed from the water vapor driven off in the heating. If the heating is severe, craters or openings may be found near the center of the mow. If strong pungent odors are driven off, the heating is great enough to be dangerous and the hay should be removed at once."

Report of tractor ratings committee, R. OLNEY ET AL. (*N. H. E. A. Bul. (1917), No. 12, pp. 7–9*).—The recommendations of the committee are that standard rating specifications for all tractors include belt horsepower, drawbar horsepower, drawbar pull in pounds, and engine and tractive speeds, and that for ordinary use in designating the different sizes or capacities of tractors a standard rating be adopted such as is at present in general use. For example, tractors should be rated as 12-25, 10-20, 12-20, etc., in which the first number represents the drawbar and the belt horsepower, respectively.

"That the standard rating be on the following basis: (1) The drawbar horsepower rating must express the horsepower that the manufacturer will guarantee his tractor—when in good condition and properly operated at rated engine speed—to deliver at the drawbar continuously for two hours on a

level, earth road, with the tractor traveling at its rated plowing speed; ... that the belt horsepower rating must express the horsepower that the ... facturer will guarantee the engine of his tractor—when in good condition ... properly operated at normal speed—to deliver at the belt pulley continu... for two hours."

Farm buildings, with plans and descriptions, H. A. SHEABER (*Chicago: ... J. Drake & Co., 1917, pp. 256, figs. 148*).—This book contains the fol... chapters: Economy of good farm buildings; two kinds of barn con... horse and cow barn; enlarged dairy and horse barn; dairy barn ... cows; dairy barn for 30 cows; monitor roof dairy stable; new models for ... barns; miscellaneous farm buildings; hog houses for winter and summer; ... poultry houses, and poultry furniture; concrete on the farm; comfort... farm homes; and dictionary of building and architectural terms.

... siderable space is devoted to the chapter on comfortable farm homes, ... includes plans and information regarding the construction of several ... and sizes of farm dwelling. The section on the farm septic tank con... among other matters, the following new information regarding sewage ...:

"A septic tank provides a scientific means of rendering sewage harmless. ... kinds of bacteria work in a septic tank. Aerobic bacteria work in ... compartment and anaerobic bacteria work in the second compart... The size of the septic tank varies according to the amount of sew... to be disposed of. The capacity of the first box or compartment should be ... to hold two days' or three days' sewage before it runs over into the ... compartment. The second compartment should be about the size of the ... The final discharge from the septic tank is supposed to be inoffensive ... is generally recommended to discharge into 4-in. draintile so that the ... may percolate away."

Silo building, W. D. NICHOLLS (*Univ. Ky. Col. Agr., Ext. Div. Circ. 43 (1917)*, ... pp.).—This is a brief note on silo building in Kentucky.

Pit silos, T. P. METCALF and G. A. SCOTT (*U. S. Dept. Agr., Farmers' Bul. ... (1917), pp. 14, figs. 6*).—This bulletin gives directions for constructing pit ... indicating the proper size and best location, and describes the practices ... have proved most satisfactory.

"Underground silos should be constructed only in soils that are firm and ... from rocks, sand strata, and seeps, and where the water table is always ... the bottom of the floor after they are dug. . . . The construction of pit ... is recommended only where a combination of soil and climatic conditions ... such as is found in the Great Plains region."

Reinforced concrete silos and small grain bins, E. S. FOWLER (*Proc. Nat. ... Cement Users, 9 (1918), pp. 498-510, figs. 7*).—This article reviews sta... data on concrete silo construction and gives information regarding ... concrete grain bins and tanks.

RURAL ECONOMICS.

Farm management [in Missouri], O. R. JOHNSON and R. M. GREEN (*Missouri ... Bul. 147 (1917), pp. 38–40*).—In these pages attention is called to the re... of a survey to determine the cost of living in Missouri. It was found that ... total cost of living on 191 farms in Saline County was $555.80, of which ... farm furnished $239.80, while on 198 farms in Dade County the total cost ... was $350, of which the farm furnished $173.80. Data are also shown regard... the labor units on Missouri farms, and the distribution of man and horse ... for various farm crops and live stock.

[Farm cost accounts at the Ontario agricultural experimental farm] (*Ann. Rpt. Ontario Agr. Col. and Expt. Farm, 42 (1916), pp. 21–29*).—These pages outline the method used to obtain the cost of producing crops, live stock, and live stock products on the farm of the Ontario Agricultural College, under the various systems employed in its management. The accounts indicate, for the crops, the various items of expense, the total yield, yield per acre, and cost per unit; for live stock, they indicate the quantity of the various feeds used, the value of the products, and the profit for the year and per unit.

Plan for handling the farm-labor problem (*U. S. Dept. Agr., Office of Sec. Circ. 2 (1917), pp. 31*).—The plan as outlined in this circular contemplates a State organization and separate county organizations, and a local organization for the distribution of agricultural laborers, and also provides for ascertaining the needs of every farm, not only as to number of additional laborers but also the time when they are wanted. In the plan presented, each unit acts as a clearing house for its territory, reporting to the units higher up only surpluses and deficits.

Forms for use in the work are appended.

Agricultural labor question in Switzerland, IV (*Pubs. Soc. Paysans Suisse, No. 54 (1917), pp. VII+194*).—To restrict the necessity for manual labor in agriculture in Switzerland, the author considers measures relative to the (1) general organization of the country, such as the influence of area, land improvements, and buildings, (2) specific organization for cultivation purposes in the substitution of motors and the use of proper implements and machines, and (3) management of the work.

[Agricultural societies in Finland] (*Landtbr. Styr. Meddel. [Finland], No. 114 (1914), pp. 91*).—In this volume are contained reports regarding the work of various agricultural societies, indicating the membership, type of organization, functions performed, and accomplishments during the year 1914.

California resources and possibilities (*Ann. Rpt. Cal. Develop. Bd. [1916], pp. 64, pl. 1, figs. 5*).—This report continues data previously noted (E. S. R., 35, p. 795).

New Hampshire farms.—Your opportunity (*Concord, N. H.: Dept. Agr. 1916, 13. ed., pp. 42, pl. 1, figs. 30*).—In this issue many advantages which the State offers to farmers are suggested.

[Agricultural resources of the State of New York], C. S. Wilson et al. (*N. Y. State Food Sup. Com. Bul. 2 (1917), pp. 18*).—This is a preliminary report of the agricultural resources of the State, ascertained through cooperation with the extension agents and school children. It indicates the amount of crops and live stock wanted and for sale by farmers, the amount of live stock on hand, amount of pasture, and the use expected to be made of the farm land.

An auto trip in New York State and what three men found about rural market conditions and farm trade (*New York: Orange Judd Co., 1916, pp. 82, figs. 28*).—This report, based on interviews with farmers and country merchants, deals with rural market conditions and farm trade for the purpose of giving "advertisers first-hand, direct information regarding the attitude of rural merchants and farmers toward advertised goods, as well as a close view of the exact conditions, as reported by the dealers themselves, in the rural districts of New York State."

Corn is king in South Dakota (*Pierre, S. D.: State [1917], pp. 32, figs. 17*).—This bulletin is descriptive of the natural conditions, and the agricultural, mineral, and timber resources of the State, including opportunities for further development and settlement.

Statistics and resources of Utah.—Report of the State Bureau of Immigration, Labor, and Statistics, H. T. Haines (*Bien. Rpt. Bur. Immigr., Labor and*

... Utah, 3 (1915-1916), pp. 492, pls. 11, figs. 190).—This is a statistical ... descriptive review of the various commercial, agricultural, mining, timber, ... water-power resources of Utah, prepared to stimulate desirable immigra- ...

Joint report on the economic and agronomic conditions in the Cagayan Valley [Philippine Islands] in relation to tobacco, C. M. HOSKINS ET AL. ... (P. I.: Gort., 1916, pp. 86).—The authors find that general economic ... in the Philippine Islands are unsatisfactory, due (1) to the scarcity ... cost of money, (2) to the inadequate transportation facilities, and (3) ... unsatisfactory marketing methods. They recommend an immediate cadas- ... survey for the Cagayan Valley, a government loan to a suggested rural ... cooperative association, and the construction of the necessary ...

A survey of agronomic conditions as to tobacco culture indicated room for ... in the cultivation of pure strains through seed selection, better and ... modern methods of culture, control of insect pests, and construction of ... curing sheds.

British industries after the war.—I, The land industry, W. EARNSHAW- ... (London: Cent. Committee Nat. Patriotic Organs., [1917], pp. 52).—This report discusses the possible development of agriculture in England and ... after the war. It recommends the increasing of the productiveness of ... soil to its maximum capacity, enlarging the number of live stock, making ... settlement in England and Wales as satisfactory as in other countries, and ... means whereby the country can grow a larger proportion of its own ...

A national agricultural policy, J. H. C. JOHNSTON (London: P. S. King & ..., 1915, pp. 40, fig. 1).—The author presents a plan of land purchase ... England, financially based on the principles of cooperative credit and ... ownership, whereby the owner would receive part of the purchase ... cash and the balance in State guaranteed bonds, or the entire purchase ... would be advanced to the farmer for a stipulated annuity.

Allotments and small holdings in Oxfordshire, A. W. ASHBY (Oxford, Eng- ... The Clarendon Press, 1916, pp. VII+198).—This survey, which supple- ... recently published information by Orr (E. S. R., 37, p. 291), considers ... history of allotments and small holdings, present conditions in reference ... demand for allotments, conditions of tenancy, methods of cultivation and ... effects, distribution of holdings, small holding colonies, county council ... and conditions as to employment, crop, and stock. The view is ... that allotments are made to cover a deficient labor wage and that the ... of small holdings, while conducive to better agriculture, shows need ... general improvement.

The economic resources of Russia, with special reference to British opportunities, A. HEYKING (Jour. Roy. Statis. Soc., 80 (1917), No. 2, pp. 187-221).—With a discussion of the general economic resources, the author presents ... concerning areas, production, and export of the wheat, rye, potato, ... tobacco, and beet-sugar crops, and information is given showing the importance of live stock, bacon, and fruit. A discussion by members is appended.

Agricultural colonization of Tripoli (Agr. Colon. [Italy], 11 (1917), No. 2, pp. 133-137).—This report recommends the appointment of a special commission to study methods of placing soldiers on the land and the ascertaining of the regions most favorable for agricultural development.

[Land tenure and settlement; agriculture and live stock in New Zealand] (New Zeal. Off. Yearbook 1916, pp. 406-465, figs. 2).—These pages continue the ... previously noted (E. S. R., 36, p. 690).

Prices and wages in India (*Dept. Statis. India, Prices and Wages India, 1917*, pp. [2]+IV+VIII+266, pls. 3).—This volume continues data previously noted (E. S. R., 34, p. 195) by adding data for later years.

[Agricultural statistics of Japan] (*Résumé Statis. Empire Japon, 31 (1915)*, pp. 227, pls. 4).—These pages give the area and production of the principal crops for 1915, with comparisons for earlier years, number of live stock for 1911, and area in forests and quantity of forest products harvested in 1915.

AGRICULTURAL EDUCATION.

Secondary agricultural schools in Russia, W. S. JESIEN (*U. S. Bur. Ed. Bul. 4 (1917)*, pp. 221).—This bulletin deals with legislation for the maintenance of agricultural schools in Russia and the organization of secondary agricultural education, including admission requirements, statistics, sources of maintenance, courses of study, and the training of teachers. An account is also given of the organization and work of the Bessarabian School of Viticulture and Wine Making, at Kishenef.

The agricultural education act of 1904 places all private agricultural schools under the supervision of the ministry of agriculture and imperial domains, now known as the general office of land management and agriculture, and provides for the maintenance of schools controlled directly by this ministry and for a considerable part of the support of private schools. Government aid for agricultural schools controlled by the department of agriculture increased from $964,828 in 1907 to $2,000,440 in 1911.

The agricultural schools are divided into three classes—lower or primary, middle or secondary, and higher schools, the latter subject to regulations not included in this act. The secondary schools have for their object the furnishing to students of a practical agricultural education, based on scientific principles, in order to prepare them for agricultural work; the higher primary schools, preparation for practical farming; and the elementary schools, preparation mainly by practical instruction, of men informed and skilled in respect to farm work.

The secondary schools are stated to be admirably organized and maintained, have a curriculum of wider scope than is necessary for purely practical instruction of peasant youths. Many of their graduates become managers of large estates, government officials, teachers, etc., while only a small part return to farming on a small scale. Almost all of the schools are boarding schools, and nominal tuition fees are charged, but poorer children are aided by scholarships from government and private sources.

On January 1, 1910, there were 15 secondary agricultural schools, the oldest of which was founded in 1822 in Moscow. The number of instructors in these schools ranged from 7 to 26 per school, the number of students from 35 to 277, the annual expenditure from $17,600 to $54,550, and the value of school property from $40,834 to $598,400. The course of study extended over six years, the last year being devoted almost entirely to practical work. The general subjects taught have nearly the same scope as in the gymnasia. Horticulture is taught 2 hours weekly in the fourth year; agriculture 3 hours, zootechny 4 hours, farm economy 6 hours, survey of the farming industry 1 hour, agricultural technology 2 hours, agricultural machines and general mechanics 2 hours, and geodesy 2 hours weekly in the fifth and sixth years each; meteorology 1 hour weekly in the fifth year; and veterinary medicine and forestry 1 hour each a week in the sixth year. Courses for training teachers for primary agricultural schools have also been established at some of these schools.

Graduates of secondary agricultural schools may continue their education in ... agricultural schools where they are accepted without examination, while ... of the viticultural school may continue their studies in the higher ... courses in Yalta, Crimea. The act of 1904 permits agricultural ... to continue their studies after they have passed the age of conscription ... which is 21 years, until the completion of the school program, but not after ... 28 years of age.

A bibliography of publications in the Russian language is included.

Twenty-third annual report of the inspector of State high schools, E. M. ... (*Ann. Rpt. Insp. State High Schools Minn., 23 (1916), pp. 73, pls. 2*).—... report on the progress in the work of the Minnesota State high ... in 1915–16. It includes statistical data on the location of State-aided ... of agriculture, the number of pupils, agricultural subjects in each ... the course of each school, number of short courses, salary of instructors, ... Similar information is given with reference to State-aided departments of ... training.

A description is given of a community school building erected at Wheaton, ... believed to be the first building of its kind in this country. It houses ... other departments those of agriculture and home training, the county ... rural agent, and the Traverse County farm bureau.

The report indicates that of a total of 230 State high schools, 152 maintained ... of agriculture and received a total of $142,382 State aid; 185 had ... of home training with a total of $108,855 State aid. The total ... in the grades in agriculture was 5,013 and in home training 7,438, ... with 3,992 in agriculture and 6,708 in home training in the previous ... The total enrollment in the high schools in agriculture was 4,643 ... home training 9,813, as compared with 4,527 in agriculture and 5,853 in ... training in 1914–15.

Introduction of agriculture into public schools (*Ann. Rpt. Dept. Agr. Prince ... Island, 1916, pp. 46–51, fig. 1*).—A brief account is given of the progress ... work of the rural science department of the Prince of Wales College in ... teachers to give instruction in nature study and agriculture in the ... schools.

The education of the farmers by the regional agronomes, F. P. MAROTTA ... Ser. Nac. [*Buenos Aires*], *Dir. Gen. Enseñanza e Invest. Agr.* [*Pub.*] *No. ... 1916, pp. 5–19*).—The author describes various phases of the work of the ... agronomes in Argentina, including itinerant chairs, consultations ... information, temporary courses, cooperative experiment fields, competitions ... expositions, and rural cooperation. This extension service was created in ...

Report of the work of the school garden association in 1915 and 1916 ... Kor. Skolehav. Virks. [*Denmark*], *1915–1916, pp. 47, figs. 22*).—A brief ... is given of the school garden work in 1915 and 1916, followed by ... on the work of individual gardens in Denmark. Reports are also in... on the instruction in school gardening given by the training schools or ... for teachers at Växjø, Lund, and Gøteborg for men, and at Kalmar ... women, and on the work of seven school gardens for children in Norway, ... five in Christiania, and nine in Sweden.

Chronicle of the woman movement in German Switzerland in 1915–16, ... STRUB (*Jahrb. Schweizerfrauen, 2 (1916), pp. 9–39*).—The author reports ... progress in home economics, professional, social, and civic training of ... the activities of women's associations, and the professional and public ... of women.

Report of the committee on teaching (*Amer. Farm Management Assoc. Rpt., 6 (1915), pp. 79–82*).—The committee confined its work to a study of graduate courses in farm management in different agricultural colleges. Answers to a questionnaire sent out indicate that graduate work is given in 13 institutions, 5 of which offer work leading to the doctor's degree. A list of problems for investigation and theses developed, leading to master's and doctor's degrees in different institutions, is included, as well as statistical data.

Farm management summer practice courses, R. L. ADAMS (*Amer. Farm Management Assoc. Rpt., 6 (1915), pp. 40–50*).—This is a description of a six-weeks' summer practice course, taken preferably between the sophomore and junior years, at the University of California, consisting of a tour of several of the distinctly agricultural sections of the State and detailed investigations of the various phases of agriculture. These trips have developed a decidedly farm management aspect. Recommendations with reference to methods of carrying on the work are made, based on the results obtained from two years of these courses. The author states in conclusion that he feels so keenly the advantages which the students secure from this kind of work, that he is very reluctant for a man to substitute in any way whatever.

The scope and methods of instruction in rural sociology, J. M. GILLETTE (*Pubs. Amer. Sociol. Soc., 11 (1916), pp. 163–182*).—The author defines rural sociology and includes in its scope physical conditions, populations, economic production, communication, health, institutions and organizations, pathological social conditions, psychology of the rural social mind, problems of small communities, relation of country to city, and rural surveys. The methods of instruction are deemed identical with those used in other fields of social science.

The teaching of rural sociology, particularly in the land-grant colleges and universities, D. L. SANDERSON (*Pubs. Amer. Sociol. Soc., 11 (1916), pp. 181–208*).—This article summarizes replies to a questionnaire as to the teaching of rural sociology sent out to representative universities and colleges in the country. The points covered include courses offered; relation to elementary sociology, political economy, rural economics, and education; definitions; prerequisites, etc.

Preparation for editorial work on farm papers, N. A. CRAWFORD (*Iowa State Agr. Col. Bul., 1 (1917), No. 5, pp. 35*).—A discussion based on replies from 146 managing editors of farm papers to a questionnaire as to the preparation desired of young men for agricultural journalism. In these replies, previous farm experience was given an average rating of 31.9, college training in agriculture 23.1, college training in journalism 13.2, experience on newspapers 17.1, and other qualifications 14.7 per cent.

Report of committee on suggestive course in agriculture for use in land-grant colleges of the South which give teacher training courses in agriculture, approved at New Orleans conference, April, 1916 (*High School Quart. [Ga.], 5 (1917), No. 4, pp. 251–257*).—An outline is given of the course approved at this conference as previously noted (E. S. R., 34, p. 799).

Practical agriculture in Texas schools through school, home, and community, J. D. BLACKWELL (*Agr. and Mech. Col. Tex. Ext. Serv. Bul. 37 (1917), pp. 95, figs. 19*).—This bulletin is intended as a guide to teachers undertaking definite projects in agriculture, and incidentally as a supplement to the numerous textbooks on elementary and high-school agriculture. It contains an explanation of home projects, home work, and credit, suggested outlines for reports on home projects, and outlines of subject matter for plant culture, general animal husbandry, dairy husbandry, poultry husbandry, fruit production, elementary soil study, vegetable and landscape gardening, crop production, farm engineering and farm management. The outlines are planned on the basis

of a 1-unit course in general agriculture, which may, however, be enlarged upon and used in schools teaching two or more units. Each outline is followed by eight school exercises with directions for their performance, which may be given as a demonstration by the teacher or worked by groups or individuals, and which should be reported by the pupils in notebooks; also suggested field trips and home projects and home work, and lists of books and references. A monthly calendar for community projects is included.

Practical education: A home library of fourteen books in one, P. G. Holden, E. J. McFadden, and O. T. Bright (*Chicago: The W. E. Richardson Co., Inc., 1917, pp. 521, figs. 89*).—This text presents a plan for the cooperation of parent and teacher in organizing and conducting over 20 home school clubs. It includes directions for growing vegetables, fruit, and flowers in school-home gardens, raising poultry, pigs, and rabbits, keeping bees, cow testing and dairy work, stock judging, practical farm arithmetic and farm accounting, social center work, salesmanship and business efficiency, and outlines of work in sewing, cooking, canning, and home building, as well as suggestions to the teacher for correlating this work with other school subjects.

School and home gardens, T. I. Mairs (*Penn. State Col., School Bul. 5 [1917], pp. 28, figs. 22*).—This bulletin contains a brief history of children's gardens and an enumeration of advantages that may be derived from children's gardens, an outline of a suggested classification of gardens based upon the purposes emphasized, suggestions with reference to gardens for schools in the country where probably for the most part the home garden should take the place of the school garden, selecting the site and crops, the size of the garden, and the preparation of the land, rules governing a garden contest for the high school, a home garden planting table, a form of records for a garden contest, plans of a model school garden prepared for the Panama-Pacific Exposition, and references to literature on gardening.

Home project at an agricultural school, C. H. Lane (*High School Quart., [Ga.], 5 (1917), No. 4, pp. 265–267*).—This is a brief statement of the home-project work required of students during the vacation between the second and third years of the 3-year courses in agriculture and horticulture for farm boys offered at the college of agriculture of the Ohio State University. These courses are complete in themselves and do not offer preparation for any of the four-year curricula, nor are they accredited toward a degree on any of these curricula.

Productive plant husbandry, K. C. Davis (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. XVI+462, pl. 1, figs. 312*).—This textbook for high schools treats the subjects of plant propagation and breeding, soils, field crops, gardening, fruit growing, forestry, insects, plant diseases, and farm management. Field and laboratory exercises, including suggestions for home projects, and references to literature for supplementary reading are given at the close of each chapter. One school year is allowed for the completion of the studies and exercises, and a preliminary study of botany is not considered essential to the understanding of the lessons.

Agricultural botany, W. Whitney (*School Sci. and Math., 17 (1917), No. 6, pp. 493–494*).—The author considers briefly the principles which should underlie the construction of a course in botany, and outlines whole year and half-year suggestive courses in agricultural botany in which the order of topics is determined so far as practicable by the season.

Feed manual and notebook, F. W. Woll (*Philadelphia and London: J. B. Lippincott Co., 1917, pp. 137*).—This manual, which has been prepared for students in agricultural schools and colleges, consists of exercises (1) relating to the value of the common feeding stuffs used in this country, their chemical composition and digestibility, methods of preparation, examination for purity,

relative feeding values, etc.; and (2) illustrating calculations of rations for farm animals, the rights and wrong uses of the various feeds for feeding horses, cattle, sheep, swine, and poultry, and general problems connected with the feeding of farm stock. Digestion coefficients of common feeding stuffs, in tabular form, and a brief list of suggested apparatus with prices are included.

Proceedings of the twenty-first annual meeting of the American Association of Farmers' Institute Workers, edited by L. R. TAFT (*Proc. Amer. Assn. Farmers' Inst. Workers, 21 (1916), pp. 139, figs. 2*).—This is a detailed report of the proceedings of the meeting held at Washington, D. C., on November 13–15, 1916. It includes the reports of committees on institute organization, institute lecturers, cooperation of farmers' institutes with other educational agencies, movable schools of agriculture, young people's institutes, resolutions, etc., and the following papers: President's address, by F. S. Cooley; Farmers' institute work in Wisconsin, Delaware, Michigan, Texas, Pennsylvania, and Iowa, by E. L. Luther, W. Webb, L. R. Taft, J. W. Neill, C. E. Carothers, and Catherine J. MacKay, respectively; extension work in Oregon, by Anna M. Turley; The Work of the U. S. Department of Agriculture, by C. Vrooman; The Extent and Possibilities of Cooperative Marketing, by C. E. Bassett; The Relation of the Smith-Lever Funds to Farmers' Institutes, by A. C. True; The Present Relation of Farmers' Institutes and Extension Schools, by D. J. Crosby; A Balanced Ration for a Community, by J. C. Ketcham; The Humus Content of the Soil, by H. J. Wheeler; Nebraska Junior Institutes in Agriculture and Home Economics; The School Lunch Basket and Its Preparation, by Mrs. D. H. Stockman; A Home Demonstration Project, by Anna M. Turley; Extension Farmers' Institute Work in Home Economics, by Belle M. Hoover; Women's Institute Work in Ontario, by G. A. Putnam; Essentials in Home Economics Teaching, by Mrs. I. L. Harrington; Statistics of Farmers' Institutes in the United States, 1915–16, by J. M. Stedman; and special notes of the work in various States and notes on farmers' institute work in Canada.

MISCELLANEOUS.

Report of the Guam Agricultural Experiment Station, 1916 (*Guam Sta. Rpt. 1916, pp. 58, pls. 10, figs. 5*).—This contains reports of the agronomist in charge, the foreman of the Cotot stock farm, and the animal husbandman and veterinarian. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Work and progress of the agricultural experiment station for the year ended June 30, 1916 (*Missouri Sta. Bul. 147 (1917), pp. 64, figs. 10*).—This contains the organization list, a report of the director on the work and publications of the station, and a financial statement for the Federal funds for the fiscal year ended June 30, 1916. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

NOTES.

Alabama Canebrake Station.—J. M. Burgess, associate professor of dairying [illegible] College, has been appointed director beginning about December 1.

California University.—Several special short courses are being offered at [illegible] Riverside on gas tractors, and at Davis to practical cheese makers on [illegible] methods in cheese making.

New York State Station.—James E. Mensching, of the Pennsylvania Institute of Animal Nutrition, has been appointed associate agronomist to succeed [illegible] Allison, promoted to agronomist and given leave of absence for post-[illegible] work at Columbia University for the year.

Ohio State University and Station.—Vernon H. Davis, professor of horticulture, has resigned to become director of the new State bureau of markets.

[illegible] station Thomas L. Guyton and Jacob R. Stear have been appointed [illegible] in entomology. J. T. Parsons has been appointed assistant in soils.

Oklahoma College and Station. W. L. Carlyle has resigned as dean and [illegible] to engage in business in Calgary, Alberta. President J. W. Cantwell [illegible] designated acting director of the station.

Pennsylvania Institute of Animal Nutrition.—A frame building 25 by 45 feet [illegible] erected for the use of the Institute. It will contain stalls and other [illegible] for the digestion and metabolism experiments carried on in connection with the investigations with the respiration calorimeter and will also [illegible] for the feeding stuffs used.

[illegible] C. Lewis, a 1917 graduate of the college, has been appointed assistant [illegible] nutrition, vice William H. Matthews, resigned to enter the military [illegible].

Tennessee Station.—The selection by the State commission of a site of 680 [illegible] near Columbia in Maury County for the Middle Tennessee substation has been approved by the county court of that county, which has appropriated approximately $100,000 for the purchase of the property. Another fund of $100,000 [illegible] buildings and a maintenance fund is available under the State legislation [illegible] previously referred to (E. S. R., 37, p. 198).

[illegible] has been begun on the new dairy barn on the Cherokee Farm of the [illegible] station. This is to cost $6,500, including two silos and accommodations for [illegible] cows.

Utah Station.—The dairy barn has been renovated and additional equipment installed, including a new milk room. The poultry department has recently completed two semimonitor and two shed-roof poultry houses, which will accommodate about 400 birds and cost approximately $700. The department of [illegible] has installed a complete set of meteorological instruments.

[illegible] J. Maughan has resigned as assistant agronomist to engage in ranching [illegible], and A. O. Larson, as assistant entomologist, to accept a position in [illegible] school at Manhattan, Mont.

Vermont University and Station.—H. E. Bartram, assistant plant pathologist [illegible] Station, resigned October 31 to begin demonstration work in plant pathology in connection with the extension service.

Washington College and Station.—F. J. Sievers, superintendent of the county school of agriculture at Wauwatosa, Wis., has been appointed professor of soils and soil physicist to succeed C. C. Thom. A. B. Nystrom, dairy husbandman, has resigned to accept an appointment as county agriculturist in Lewis County, effective October 1.

American Association for the Advancement of Agricultural Teaching. The eighth annual meeting of this association was held in Washington, D. C., November 13, 1917. Special prominence was given to problems affecting secondary education, including developments under the Federal Vocational Education Aid Act.

W. H. French, of Michigan, president of the association, traced the development of secondary school agriculture in this country from 1888 to the present, calling attention to the prominence now given the subject through the passage of the Federal Vocational Aid Act. J. P. Monroe, of the Federal Board for Vocational Education, discussed the act in operation. He laid emphasis on the fact that this act provides for normal education for normal persons. It is not an inferior kind of education but aims to make broad and intelligent citizens. He also described the present Federal organization, and outlined some of its policies. L. S. Hawkins, assistant director of agricultural education for the board, under the subject What Constitutes Proper State Supervision of Home Projects, showed how the supervision should stimulate progress and encourage the teachers rather than merely standardize and contribute a check as to formal requirements.

F. B. Jenks, of the University of Vermont, showed how practical and valuable extension service might be the logical outgrowth of the high school work in agriculture and how this might cooperate with the work of the county agent within the territory of the school. Numerous examples of this service rendered by high schools in Vermont were cited.

In a paper on Minimum Laboratory Equipment for Agriculture in High Secondary Schools, by J. A. James, supervisor of secondary agriculture in Wisconsin, emphasis was laid on the necessity for useful apparatus which in many cases might be found and used at the home farms. The list of absolutely essential apparatus was very brief and for the most part comprised material useful in farm operations.

The relations of the association to the National Society for the Promotion of Industrial Education were discussed, and resolutions adopted declaring that the association should continue, but take steps looking toward the proper recognition and representation of agriculture in the society, and possibly toward amalgamation of these organizations. The incoming president, together with W. R. Hart of Massachusetts, and Z. M. Smith of Indiana, were appointed to represent the association in this matter.

The standing committee on the cooperative use of equipment and illustrative material presented a report by H. P. Barrows on Illustrative Material The States Relations Service. The committees on essential laboratory equipment for teaching agriculture in secondary schools and the relation of general science to agricultural instruction reported progress and were continued with the same personnel for another year, but a resolution was adopted substituting annual committees for standing committees.

The officers elected for the ensuing year were as follows: President, G. A. Works, Cornell University; vice president, W. G. Hummel, field agent of the Federal Board for Vocational Education; secretary-treasurer, F. E. Heald, States Relations Service; and additional members of the executive committee, L. S. Hawkins, Federal Board for Vocational Education; G. M. Wilson, Iowa State College; and Dean Alfred Vivian, Ohio State University.

American Society of Agronomy.—The tenth annual meeting of this society was held in Washington, D. C., November 12 and 13.

The presidential address was given by W. M. Jardine at a joint session held with the Society for the Promotion of Agricultural Science. Dean Jardine took for his subject The Agronomist of the Future, outlining the opportunities for service and the obligations imposed upon the trained agronomist with respect to the present emergency. He especially emphasized the necessity of gaining the confidence of the farmer by offering him ideas which are practical and workable as well as theoretically correct, and likened the agronomist to the "middleman" standing between the investigator in pure science and the farmer. He maintained further that the primary duty of an agricultural college in granting the B. S. degree was to train agricultural teachers and farmers, not to turn out full-fledged scientific investigators. In concluding he urged that the agronomist be untiring in his study of the fundamentals and that the society encourage its members to pursue research studies.

Other papers presented before the society included the following: Mineral Food Requirements of the Wheat Plant at Different Stages in Its Development, by A. G. McCall; Effect of Sodium Nitrate Applied at Different Stages on the Yield, Composition, and Quality of Wheat, by J. Davidson and J. A. LeClerc; Some Facts Regarding the Soft or Flour Corns, by H. H. Biggar; Drainage Tanks for Soil Investigations—Some Preliminary Studies, by C. A. Mooers; Increasing Crop Production on the Basis of the Distribution of the Natural Nitrification, by A. E. Waller; Reaction of Weed Growth to Nitric Nitrogen Accumulation in the Soil, by L. E. Call and M. G. Sewell; Wheat Breeding Ideals, by H. Snyder; Red Rock Wheat and Rosen Rye, by F. A. Spragg; Calcium in Its Relation to Plant Nutrition, by R. H. True; The Triangle System for Fertilizer Experiments (with some remarks on the potash hunger of potatoes), by W. Frazier and J. J. Skinner; Some Tests of an "All-Crops" Soil Inoculum, by P. Emerson; Corn and Wheat Soils in the United States, by C. F. Marbut; Methods Used in Cereal Investigations at the Cornell Station, by H. H. Love and W. T. Craig; The Significance of the Sulphur in Sulphate of Ammonia Applied to Certain Soils, by C. B. Lipman; and Aluminum as a Factor Influencing the Effect of Acid Soils on Different Crops, by B. L. Hartwell and F. R. Pember.

The entire session was devoted to varietal classification and nomenclature. The report of the committee upon varietal nomenclature embracing six years' work was read and discussed. This report is to be published in full in the *Journal of the American Society of Agronomy*. It included a "Code of Nomenclature" and a motion was adopted that the society appoint a committee to work in cooperation with the American seed trade and any other agencies to secure uniformity in rules and practices of varietal nomenclature and registration. In connection with the presentation of the report, C. R. Ball discussed the classification of Western Wheat Varieties, exhibiting mounted specimens to illustrate the scheme of classification employed, and gave a paper on Naming Western Wheat Varieties, which outlined the use of the proposed Code of Nomenclature as applied to wheat. Mr. Ball emphasized the immediate necessity for a systematic naming of varieties, to be followed later by a scheme of classification.

Summarized reports were submitted by the committees on the standardization of field experiments and agronomic terminology. Brief reports were also submitted from local sections in Iowa, Kansas, Cornell, Ohio, South Dakota, New England, and Washington, D. C.

The following officers were elected for the ensuing year: President, T. [illegible] Lyon; vice presidents, A. G. McCall and C. B. Lipman; and secretary-treasurer, F. V. Gardon.

Potato Association of America.—The fourth annual meeting of this association was held in Washington, D. C., November 9 and 10, 1917.

The program included addresses by Assistant Secretary Vrooman of the U. S. Department of Agriculture, Hon. H. C. Hoover, W. T. Macoun, C. A. Zavitz, and W. S. Blair, and papers on the following subjects: Feeding Value of Raw, Cooked, Silaged, and Pressed Dried Potatoes for Hogs, by F. G. Ashbrook; Feeding Value of Silaged and Pressed Dried Potatoes for Dairy Animals, by T. E. Woodward; The Farm Manufacture of Potato Starch, by H. C. Gore; The Preparation of Potato Silage, by L. A. Round; The Dehydration of Potatoes, by L. D. Sweet; Potato Utilization Work of the Bureau of Chemistry, by C. L. Alsberg; Fertilizer Studies on Potash Hunger of the Potato and Other Field Crops, by O. Schreiner; The Dietary Value of the Potato, by C. F. Langworthy; The Potato Situation and the Department's Work on Potatoes, by J. Corbett; Distribution of the Potato Crop, by E. P. Miller; Car Movement of Potatoes, by H. Elliott; Potato Growing and the Present Fertilizer Situation, by H. G. Bell; and The Production of High-Grade Seed Potatoes, by D. [illegible].

Committee reports were also submitted upon seed improvement and certification, research, varietal nomenclature and testing, market standards and marketing, utilization of surplus stock and culls, transportation, potato contests and exhibitions, crop forecasting, publications, and education.

Officers were elected for the ensuing year, as follows: President, L. D. Sweet; vice president, W. T. Macoun; secretary-treasurer, W. Stuart; and members at large of the executive committee, H. G. Bell and H. E. Horton.

Miscellaneous.—The report of the committee of the Privy Council for Scientific and Industrial Research of Great Britain for 1916-17 states that substantial progress has been made for establishing a national research association for cotton. The committee has offered a grant of money to the Imperial Commissioner of Agriculture in the British West Indies, and it is hoped that in due course the new association may take over this work.

The food production department of Great Britain has established a new testing station in London. H. B. Renwich has been appointed director of feeding stuffs at the ministry of foods to organize the supply and distribution of feeding stuffs, particularly oil meal.

Plans are being devised in Great Britain for holding short training courses for soldiers who are available for agricultural work. Particular attention is to be given to the handling of farm machinery, especially tractors and plows.

A national institute is to be established in Italy to investigate the relation between malaria and agriculture, the cause of the unhealthfulness of many districts, and the organization of a campaign against these causes.

A chair of the pedagogy of agriculture has been established at the University of South Carolina. V. E. Rector, principal of the Antioch Industrial School, has been appointed to the position.